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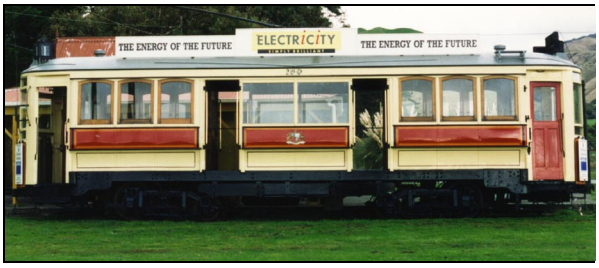

Wellington Heritage Tramway
Feasibility Study

Prepared For
Wellington Capital Development Agency
Lambton Harbour Management Ltd
Stagecoach Buses

By
Douglas Economics
August 1993

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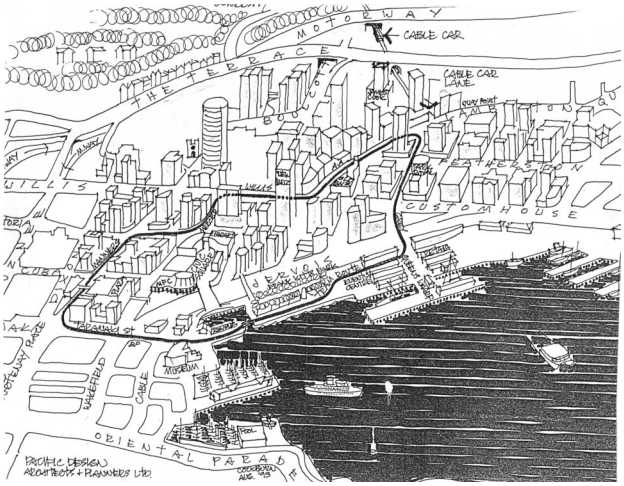

With a Little Help from our Friends.....

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Douglas Economics takes full responsibility for any errors, omissions and views expressed.

Executive Summary
Wellington Heritage Tram

Douglas Economics (formerly Pacific Consulting) was commissioned by the Wellington Capital Development Agency, Lambton Harbour Development and Stagecoach in June 1993 to undertake a feasibility study for a Heritage Tramway in the City Centre of Wellington and also to appraise an information office at the intersection of Lambton Quay and Grey Street. A 2.2 kilometre loop service is recommended with the Tramway running:

Grey St/ Lambton Quay - Willis St - Mercer St - Victoria St - Manners Mall - Taranaki St - National Museum - Lambton Harbour - Grey St / Lambton Quay

It is recommended that the Tramway be constructed in two phases

Phase I:	Cable Car to Museum
Phase II:	Full Loop

The total infrastructure costs for the entire loop:- track, overhead wiring, service diversion and stations (excluding depot, trams and professional fees) have been estimated:

Phase I	$1.3 million
Phase II	$5.4 million
Total	$6.7 million

Service diversion costs, particularly *Telecom,* will be critical (service diversion costs are estimated at $4.2 million).

It is strongly recommended that the track is 3'6" gauge to be compatible with New Zealand Rail. This would provide additional flexibility of linking into any future Light Rail scheme for central Wellington.

Track maintenance costs are estimated at $138,000 p.a. from the year 2000.

Phase I will require two trams. *Phase II* will require four trams to provide a service every ten minutes in both directions. An additional spare should be purchased. The capital cost of purchasing the five trams is estimated at $2.1 million. It is recommended that a two authentic Wellington trams and three imported trams be used - Hongkong is the most likely source. Total tram operating costs are estimated at $283 thousand. Costs rise to $457 thousand in 1996 and to $582 thousand in the year 2000. The main costs would be: drivers wages; electrical power, management expenses and tram maintenance.

Demand for the tram would originate from four main sources:

- ***Visitors to Wellington*** - International and Domestic tourists and business visitors who may use the tram to get about or as an attraction in its own right;
- ***Visitors to Lambton Harbour*** who may use the tram to visit the development or as part of their visit;
- ***Pedestrians*** - people currently walking along the route who may opt to use the tram instead;
- ***Bus Users*** who may divert to the tram for all or part or their journey.

Phase I is forecast to achieve just under 700 thousand trips in 1995 which is equivalent to the current usage of the Cable Car. *Phase II* is projected to achieve 2.1 million trips in 1996 rising to 3.7 million in 2011. Pedestrians and visitors make up 80% of the ridership forecast. Visitors to Lambton Harbour and diversion from bus make up the remaining 20%. Including advertising and sponsorship, the Tramway is forecast to earn $663 thousand in 1995 *Phase I* and just over $2 million in 1996. Revenue is forecast to rise to 3.5 million in 2011. From a farebox and operational perspective, a frequency of every ten minutes and a fare of $1 are recommended. The forecasts were based on desk-top and market research surveys. Two hundred people were interviewed. It is recommended that the sample sizes be increased to improve the accuracy of the forecasts.

The Tramway is forecast to be profitable. Before tax, the internal rate of return of the project is 19%. At an interest rate of 9%, the financial benefit - cost ratio is 1.5 - for every dollar spent, $1.50 is earned. The pay-back period is thirteen years. Profit before interest and tax is estimated at $880 thousand in the first year of operation. In year six (2001), when operating costs stabilise at $760 thousand per year, profit before interest and tax is forecast at $1.21 million. Four project characteristics could tend to argue against structuring the project with any significant debt element:

- the unproven nature of the project;
- the sensitivity to patronage and revenue per ride;
- further uncertainties surrounding the initial capital cost of the project and the ongoing operating costs;
- the specialised nature of most of the project's assets.

The adoption of a 50/50 debt/equity ratio would produce a tax paid profit of $0.29 million in 1996 and $0.6 million in 2001. Return on equity could be 5.8% in 1996 and around 10% in 2000.

WCC assessment of the Traffic Management aspects of the project suggests that the proposed loop is "a viable route". Traffic in the area is expected to flow without extreme inconvenience. A more detailed study would need to be undertaken if the project proceeds.

The risks and nature of the Tramway may be such that some Local Authority funding is required. If this is the case, the Tramway construction, management and operation would be best organised by the Wellington Cable Car Ltd which is owned by the Wellington City Council and funded by the Wellington Regional Council.
WCC or a private company could provide the trams and pay a rental for used of the track. Any tram operator will require a licence and will be required to submit a safety system. Provision for the Tramway would need to be made in the new District Plan currently being prepared in accordance with the Resource Management Act.

The Tramway could be incorporated into other rail proposals for the City Centre being considered by New Zealand Rail. Extension to Courtenay Place also has long term merit.

An information office at the intersection of Grey Street and Lambton Quay featuring a roofed station with a Maori arch and decorations is recommended.

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1. Introduction

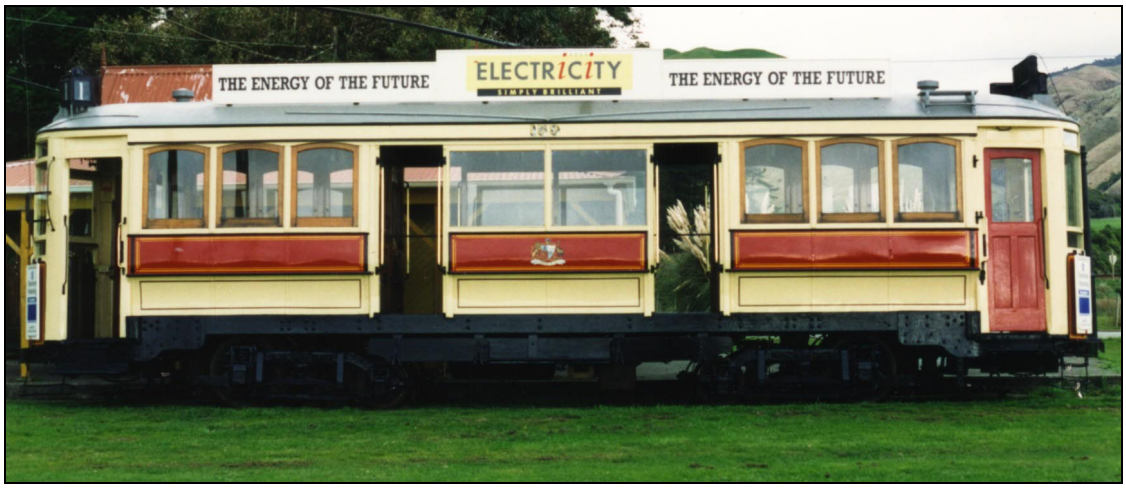
1.1 Study Details

Douglas Economics was commissioned by the Wellington Capital Development Agency, Lambton Harbour Development and Stagecoach in June 1993 to undertake a feasibility study for a heritage tramway in the city centre of Wellington and also to appraise an information office at the intersection of Lambton Quay and Grey Street.

The proposed service connects the central shopping areas of Lambton Quay, Willis St., Manners Mall with the existing and intended tourist and recreational facilities of Lambton Harbour, the new National Museum of New Zealand, the Civic Centre and the entertainment sector of Courtenay Place.

- The service is intended to appeal to tourists by being "fixed", using "fun" heritage trams and linking into the exciting Lambton Harbour Development.
- The tramway will also appeal to local users and provide a boost to retailing and office activity by linking up key sectors of the central city.

Plate 1: Double Saloon Wellington Tram - built in 1921, restored and operated at Paekakariki by the Wellington Tramway Museum Incorporated



1.2 Study Scope

The study was conducted to a tight budget and timescale. All important issues were covered although technical aspects were only able to be addressed in a superficial way:- areas in particular need of more detailed analysis are highlighted. The focus of the study was to:

- propose a route taking into account costs, demand and traffic management issues;
- determine the capital and operating costs;
- forecast the likely ridership and revenue for the service.

1.3 Wellington's Tram Heritage

Wellington was the first New Zealand city to introduce trams and the last to take them out of service. An extensive tram system operated in Wellington from the turn of the century to 1964, see the network map in Figure 1.3. The network extended from Wadestown in the north and Karori in the West to Island Bay and Seatoun in the south. Trams ran along all the major street of central Wellington: Lambton Quay, Willis St, Customhouse Quay, Jervios Quay and Courtenay Place. Although the last tram ran in 1964 a high level of relevant engineering and operating expertise fortunately remains in Wellington.

In particular:

- the Wellington Tramway Museum Inc. formed in 1961 has kept seven Wellington trams which could be restored and returned to service;
- Wellington's trolley bus overhead wiring system owned by the Wellington Cable Car offers cost-effective electrical infrastructure and expertise for the tramway and an ownership *"vehicle"* for the tramway infrastructure.

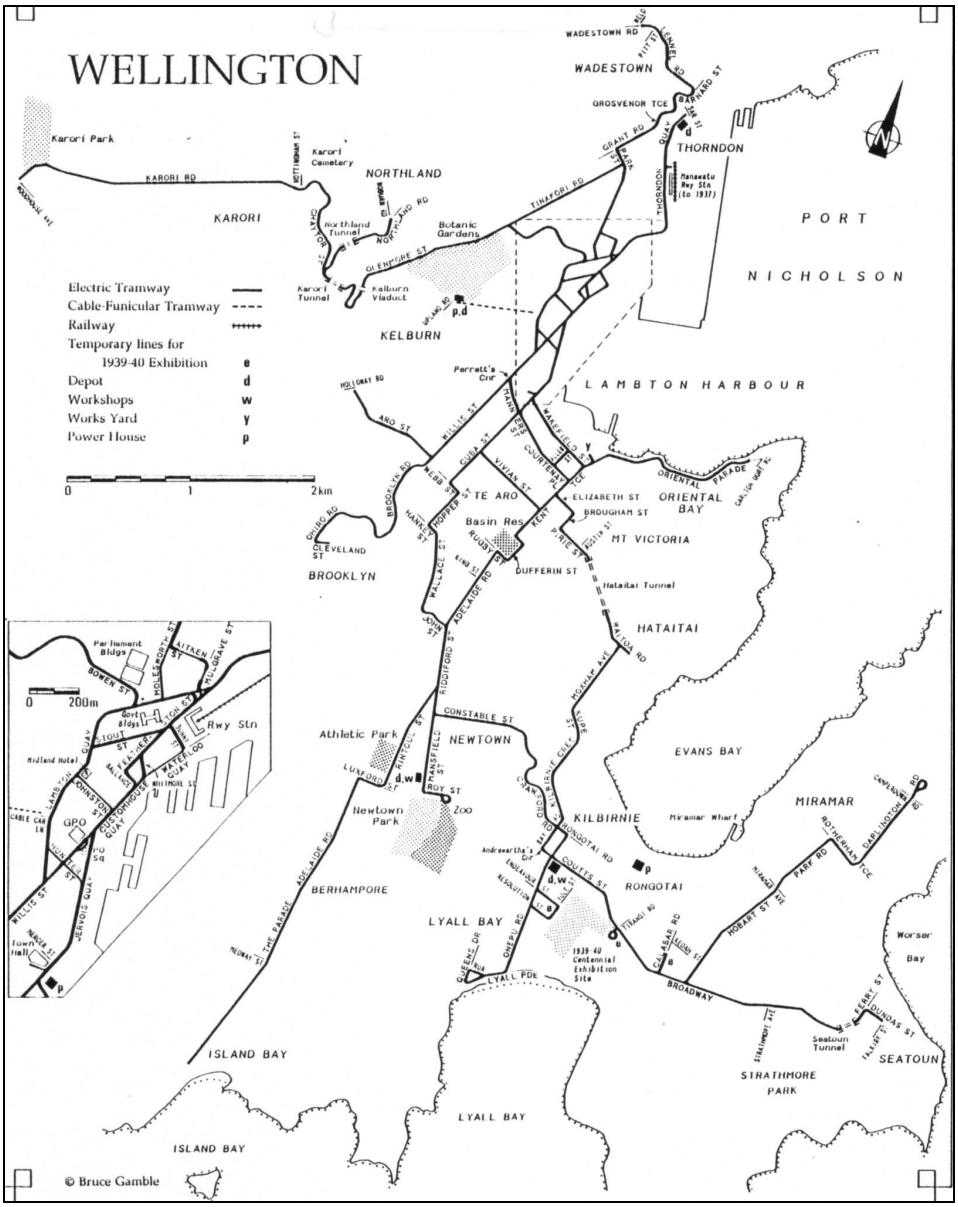
1.4 Revival of Interest in Heritage Trams

Recent years has seen a revival of interest in trams both in New Zealand and abroad:

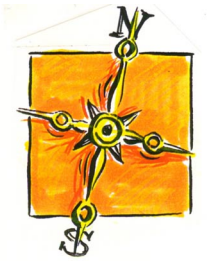
- Christchurch reintroduced trams onto a two kilometre loop linking places of tourist interest in the heart of the City in the mid '90s.
- The Jackson St. Programme, Petone considered trams in 1993.
- Several American cities run heritage tramway systems eg Portland, San Jose, San Francisco, Seattle, Detroit.
- Bendigo (Australia) operates heritage services and Brisbane was investigating trams for its city centre.
- In the UK, Birkenhead purchased trams from Hong Kong to operate a historic tram service in 1993.

Plate 3: A tram museum in Birkenhead purchased trams from Hongkong in 1993. Photograph provided by Ian Turner

Wellington Tram Map



Courtesy of Graham Stewart
Taken from "End of the Penny Section" Grantham Publishing



2. Route & Phasing

2.1 Proposed Route

The proposed route is shown in Figure 2.1. A 2.2 kilometre loop service is recommended with the tramway running:

> Grey St / Lambton Quay - Willis St - Mercer St - Victoria St - Manners Mall - Taranaki St - National Museum - Lambton Harbour Water Front - Grey St and Lambton Quay.

2.2 Route Justification

- The loop broadly follows an earlier route proposed by Athfield Architects but has been extended to take in Manners Mall - an area of high pedestrian count, and to provide closer access to the entertainment district of Courtenay Place;

- The route fits in with New Zealand Rail's objective of linking the Railway Station and Courtenay Place via Lambton Quay, Willis and Manners Mall;

- The heritage tram route *diverts* around Civic Square to access the Library, Civic Square, the Michael Fowler Centre and the Plaza International Hotel which are all major places of leisure and tourist interest. New Zealand Rail is happy with this diversion rather than being via Willis / Manners.

2.3 Phasing of Options

It is recommended that the tramway be constructed in two phases:

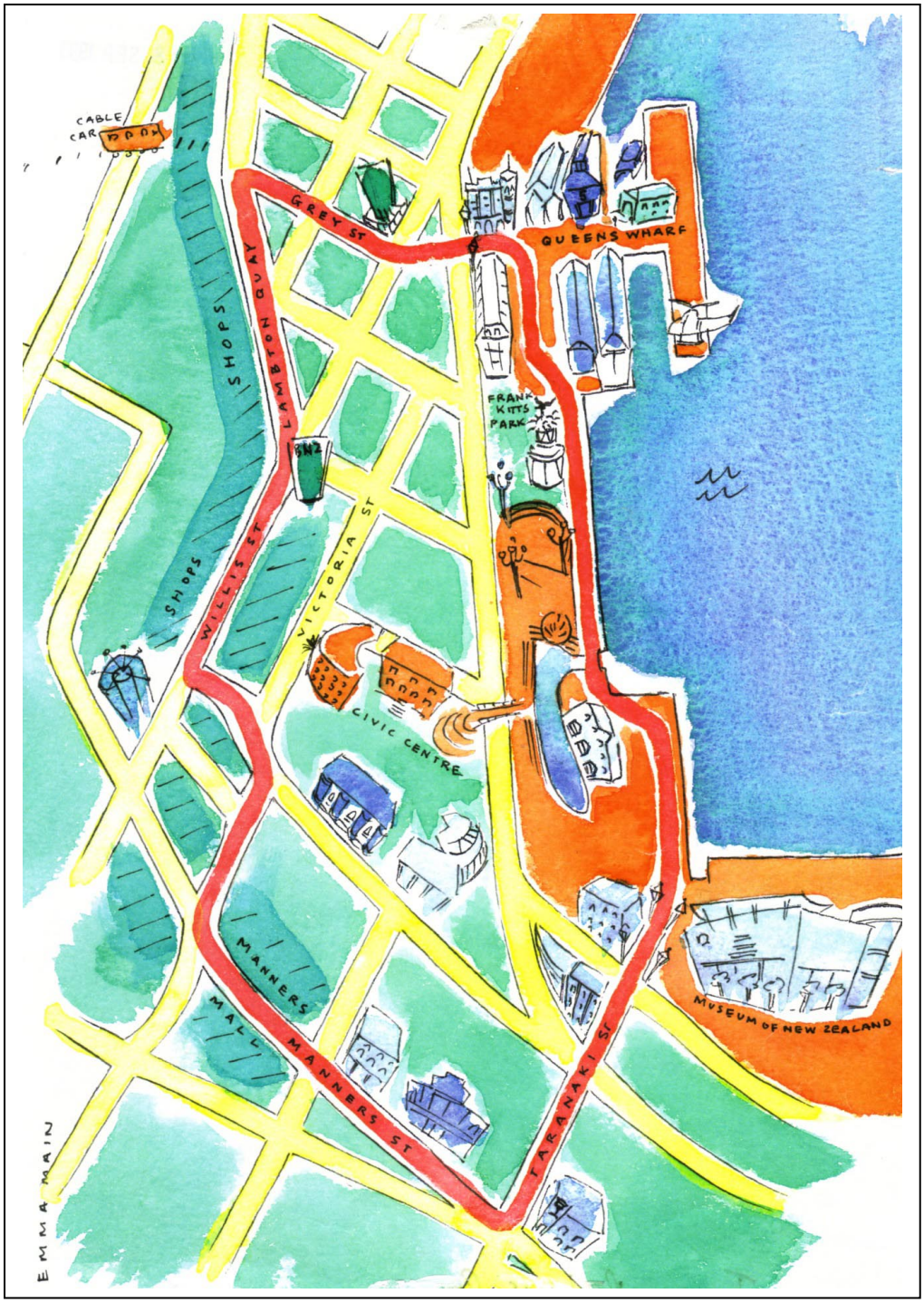
- *Phase I*: Cable Car to Museum
- *Phase II*: Full Loop

Phase I Cable Car to Museum:

Phase I is 840 metres in length. Trams could run by early 1995. The length of track is less than one kilometre and apart from 180 metres would not entail any street works. Five stops are recommended: Cable Car, Events Centre, Frank Kitts Park, Boat Sheds and Museum.

It is recommended that a passing loop be incorporated to enable a service every ten minutes at popular times. Two trams would be required - at least one should be obtained from the Wellington Tramway Museum Ltd to give *authenticity*. The trams would require modification and restoration for city running but this should be possible by early 1995. Without passing loops, the service would require one tram;

Figure 2: Route Map



A depot to house the tram over night would be required for minor maintenance and to provide protection from weather and vandalism. This could a temporary building until the full loop is complete. Potential depots are: a temporary building, a Wharf building or the Free Ambulance building (possibly only temporary use only).

It is recommended that the tramway should continue to the Museum stop before the National Museum opens in 1998:

The "Museum" stop is at the Wakefield Street entrance to the Lambton Harbour complex and therefore provides a natural point for the southern terminus and an attractive harbour route for local patronage from the Courtenay Place district to Lambton Quay.

The Museum stop is also close to the Wakefield Markets and is in proximity to the Plaza International Hotel.

Although not recommended, the Museum stop could be omitted until the National Museum opens in 1998. The tramway could instead terminate at the Boatsheds if the Free Ambulance building can be used as a depot. This could save 180 metres of track and overhead wiring in the short run (eventually needed). Terminating at the Boatsheds could permit a fifteen minute service interval to be achieved easily with a single tram.

This solution is not recommended however the Boat Sheds stop would be a less popular terminus than the Museum stop at the Wakefield St. intersection and would restrict the Tramway's ability to link the Harbour Development with the rest of the city.

It would be possible to sub-phase Phase I into:

Phase IA: Cable Car to Events Centre Queens Wharf - 180 metres long enabling a ten minute shuttle service with one tram without passing loops.

Phase IB: Events Centre - Museum

This sub phasing is however not recommended for the following reasons:

- A ride of three minutes (one way) would severely limit the tramway's appeal - see section 5.
- Housing the tram would be difficult unless extra track and a temporary depot was built - with associated costs of say $50,000.
- Costs savings could be achieved by building Phase I at one go.

However if built in sections, Phase IA should be operated as soon as possible to contribute net revenue to the overall project subject to revenue exceeding the costs associated with early commencement.

More detailed evaluation should be undertaken on any sub-phasing of Phase I.

The possibility of extending the link from the Museum to the corner of Taranaki and Dixon at the outset or soon afterwards should also be considered. This extension has the merit of terminating the link at a junction of higher pedestrian count than at the Wakefield St Cable St intersection.

Phase III Complete Loop:

The complete loop is 2,180 metres in length, 1340 metres additional to Phase I. The additional track could be laid and the required trams acquired and made ready for operation by mid - late1996. All additional track would be in-street; nine stops are proposed of which BNZ, Civic Centre, Manners Mall and Te Aro Park would be additional to Phase I, see section 2.4.

It is recommended that the service should operate in both directions and four trams purchased. At least two passing loops would need to be incorporated; one in Manners Mall and one along the Harbour are recommended.

Traffic Management problems may necessitate double track over longer sections or mitigate against two way operation - this is discussed in subsequent sections.

Without passing loops, operation would be anti-clockwise i.e. Lambton Quay to Manners Mall to Lambton Harbour to minimise traffic disruption.

It is recommended that detailed engineering analysis be undertaken of alternative tramway designs.

2.4 Proposed Timetables

Phase I could provide a service every ten minutes with two trams and one passing loop. The end to end running times would be seven minutes with a three minute lay over at each end stop. Without a passing loop, one tram could provide a service every twenty minutes.

Phase II conditions especially at intersections will govern the timetable. Trams should be able to complete the loop in twenty minutes however. Two trams could provide a ten minute frequency.

Figure 2.4: Proposed Timetables

Phase I: Cable Car to Museum

Stop	Distance (metres)	Time (minutes)
Cable Car	-	-
Events Centre	180	3
Frank Kitt's Park	420	4
Boat Sheds	660	6
Museum	840	7

Single Track – one passing loop and two trams:
Trams depart every 10 minutes from cable Car and Wakefield St at 00,10,20,30 ,40 and 50 mins past the hour.

Phase II: City Centre Loop

Stop	Distance (metres)	Time (minutes)
Cable Car	-	-
BNZ	300	2.5
Civic Square	540	4
Cuba Street	860	6.5
Te Aro Park	1,050	7.5
Museum	1,340	10
Boat Sheds	1,520	11.5
Frank Kitt's Park	1,760	12.5
Events Centre	2,000	14
Cable Car	2,180	17

With two passing loops (allowance for waits at both) and extra waiting time at the Cable Car stop would give a 20 minute circuit time. Four trams would enable a service every ten minutes in both directions.

Sketch 1: Grey Street from Cable Car to Queens Wharf & Queens Wharf to Cable Car

Daryl Cockburn (Pacific Design)

3. Track, Overhead & Service Diversion

The total infrastructure costs for the entire loop:- track, overhead wiring, service diversion and stations (excluding depot, trams and professional fees) was estimated at $6.7 million in 1993 prices.

- *Phase I* was estimated to cost $1.3 million.
- *Phase II* was estimated to cost $5.4 million.

The cost of service diversion eg telecom and gas were considered critical (estimated at $4.2 million).

It is strongly recommended that more detailed work be undertaken to determine the extent and cost of necessary service diversion.

3.1 Track Costs

Track costs are estimated at:

Phase I	$ 456,650
Phase II	$1,036,450
Total	$1,493,100

3.2 Track Gauge

The study recommended 3'6" gauge is used so that the track would be compatible with New Zealand Rail. This would provide additional flexibility of linking into any future Light Rail scheme for central Wellington.

3'6" remains a gauge used by a small number of tramway systems or museums overseas that could supply vehicles on a permanent sale or loan basis. Although the old Wellington trams ran on 4' gauge, it should be relatively straightforward to modify the existing bogies or purchase *bogie swaps*.

.

The proposed route included four sharp curves; 3'6" gauge can cope more easily with sharp curves than wider gauges such as 4' or standard (4'8 1/2").

3'6" gauge is close to metre gauge used on many European Tramways; these systems (listed below) provide a source of trams and mechanical parts that would require little modification.

Heavy maintenance work could be carried out at the TransTec workshops at Woburn and would be greatly facilitated by using 3'6"gauge.

3.3 Single or Double Track

Single track would provide sufficient capacity with two passing loops to enable two-way operation. The track should be positioned to enable future double track along the Lambton Quay - Courtenay Place section; service diversions should take this into account.

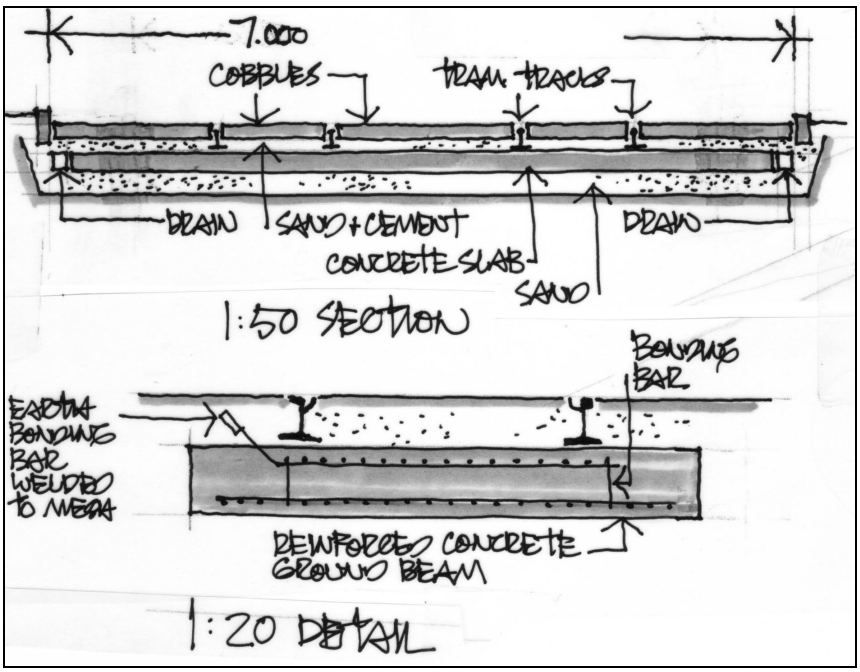
Passing loops should be incorporated along the Harbour and at (i) Manners Mall or (ii) along Willis Street with one tram operating Mercer - Victoria; the other Willis Street - Manners. Option (i) was preferred for cost reasons but two way operation in Mercer-Victoria could be problematic (see Section 7).

Two way operations would greatly enhance the appeal of the service, especially for local ridership.

3.4 Track Specification

Track foundations should be 450mm deep - a similar cross section to Manchester. Two alternative cross sections are shown in Figure 3.4.1.

Figure 3.4.1: Alternative Track Cross Sections



Daryl Cockburn

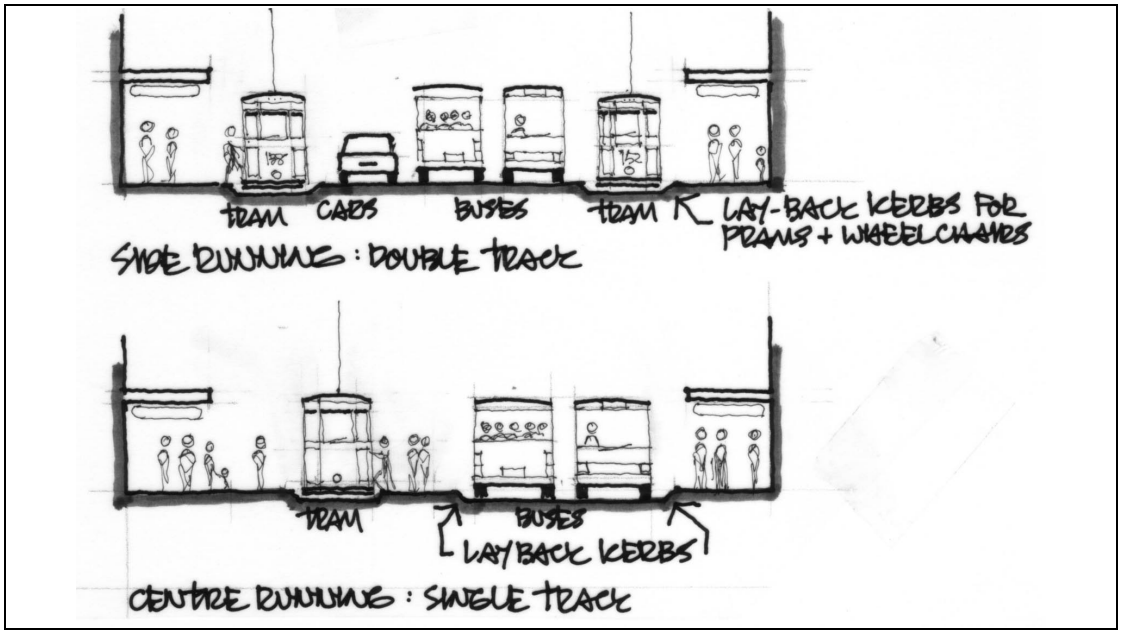
The track should be paved. Street running sections should be built to a higher engineering standard than sections along the Harbour and Manners Mall. Concrete slab track should be used for the road sections; cheaper paved and ballasted track should be used for Lambton Harbour and Manners Mall. This would not compromise visual appearance but would save costs. Concrete slab track was costed at $670 per metre. Ballast track was costed at $480 per metre.

Christchurch used two different standards of rail for its heritage tram. On straight sections, ex-New Zealand Rail track was used to reduce costs. On curves, new grooved rail from overseas (UK/Australia) was used. The total track cost for Christchurch (1.95 km loop) was $3 million or $1.5 million per kilometre.

3.5 Positioning in the Road

From a safety perspective, the Tramway should be located to the side of the road: - being close to the footpath would make it safer for boarding and alighting. Side running would have the disadvantage of limiting car parking and reducing vehicular access to shops and offices. Also two way operation could require central running to reduce conflicts with vehicular traffic (see section 7). Alternative track positions are shown in Figure 3.3.

Figure 3.3: Alternative Track Layouts



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3.6 Overhead Wiring

Overhead wiring was estimated to cost:

Phase I	$ 249,200
Phase II	$ 530,183
Total	$ 779,383

Trolley bus wiring system should be utilised where available. *Capital Power* considered that no new substations would be required to power the system. Wellington Cable Car provided an overhead cost estimate for the route. Visually pleasing poles for the Lambton Harbour stretch were costed. The overhead wiring system should enable three-way compatibility

between trams, trolley buses and any future Light Rail that could operate the Railway Station- Courtenay Place section.

3.7 Stops and Stations

Nine stations/stops were costed:

Phase I	$ 110,000
Phase II	$ 120,000
Total	$ 230,000

Five stations/stops were costed for *Phase I*: Cable Car, Events Centre, Frank Kitts Park, Boat Sheds and Museum. For *Phase II* four additional stops were costed: BNZ, Civic Centre, Manners Mall and Te Aro Park.

3.8 Service Diversion

Service diversion including traffic management measures that were costed at:

Phase I	$ 582,769
Phase II	$ 3,808,969
Total	$ 4,391,738

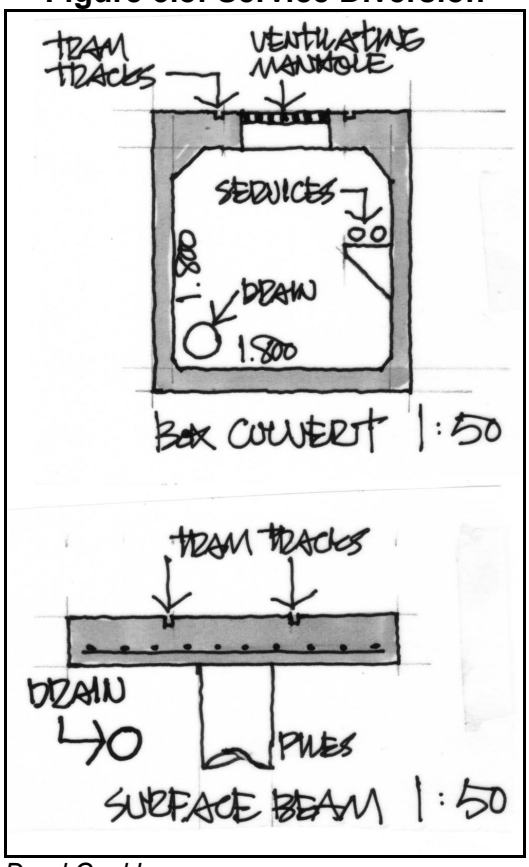
Service diversion costs were likely to be *the* critical cost element especially for *Phase II* which is all street running.

Service diversion was considered necessary where tram tracks would inhibit utilities from servicing their pipes and wiring. One option would be to leave services *insitu* and 'ignore' service diversion until problems manifest themselves causing tram curtailment and/or increased utility repair costs. The alternative option would be to *divert utility services* at the outset; this would incur higher initial costs but would result in lower running costs and could also yield some utility service betterment. Cityworks considered that:

- Disruption could be expected from trenching activities unless the track system was built strong enough to allow underground services authorities to excavate underneath the tracks.

- Cityworks suggested that a tram track could be constructed as a deep box culvert so that underground services could be laid within it, see alternative 2 in Figure 3.8.

Figure 3.8: Service Diversion



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- Care would be needed to ensure rail foundations were soundly married with the adjacent pavement.

- All underground service authorities would need to be consulted and their interests accommodated.

In Christchurch, service diversion costs were low principally because telephone wires were under the footpath and not under the road and there was no reticulated gas. One high voltage power line was in the carriageway but did not pose any problems. The only service diversion costs were sewer diversion ($90,000) and shifting one year old street poles in Armagh Street. Christchurch set up an in-house project team to assess service diversion with all affected utilities included; this was recommended for Wellington.

By contrast, service diversion costs for Manchester LRT were much higher - estimated at $NZ 6 million per kilometre.

In Wellington, eight utilities were considered to be affected and it was considered that service costs would be significantly higher than Christchurch but significantly lower than Manchester. Drilling technologies were improving with transmitter and computer aided drilling becoming available that allows for angle maintenance in future.

Cityworks estimated approximately seventy trenching jobs a year took place on the proposed route, see Table 3.8

Table 3.8: Trenching Jobs on Tram Route

Organisation:	Percentage by Organisation
Waterworks	45%
Enerco Gas	18%
Capital Power	10%
Clear Communications	7%
Private Drainlayers	7%
Telecom	6%
Drainage WCC	6%
Traffic Light Cabling WCC	1%

Douglas Economics circulated a proforma to:

- Capital Power
- Clear Communications
- Enerco Gas
- Telecom
- Wellington City Council Drainage
- Wellington City Council Traffic Signals
- Wellington City Council Parks & Recreation
- Wellington Regional Council, Water

No diversion costs were included for Capital Power. Capital Power considered that "at 450mm foundation depth, cable diversion would o be minimal if at all". Capital Power might lay spare ducts under the tracks (prior to installation at intersections they considered to be strategic.

Clear Communications were planning to have lines in Willis Street, Lambton Quay and Mercer Street and were proposing to look into the need and cost of diverting services. Costs were estimated at:

Phase I	$	31,500
Phase II	$	100,740
Total	$	132,240

Based on estimated supplied by Enerco Gas, the following costs were assumed:

Phase I	$	50,000
Phase II	$	523,400
Total	$	573,400

Telecom was likely to be the most expensive although it had a low share (6%) of trenching jobs on the route. The costs were estimated at:

Phase I	$	315,000
Phase II	$	1,007,400
Total	$	1,322,400

Telecom considered that the tram would have "considerable effect on the City's Telecom Cable/Duct network". The Tramway takes the same path as a main Telecom 10 x100 duct route i.e. Manners, Victoria, Willis and Lambton. At strategic points (usually intersections) duct spurs or manholes are located. Telecom digs up the road when (i) a cable fault (emergency) occurs (usually unexpected and unplanned with the most common cause being other service utilities digging in the area and unknowingly hitting a cable); (ii) planned work was approved – normally the end result of enhancing the network to avoid digging in the spot again.

Telecom viewed diversions necessary at:

- Lambton Quay (10 cables)
- Featherston and Grey Street intersection (20 cables)
- Jervois Quay, opposite Queens Wharf (12 cables and 3 fibre cables)
- Cable and Taranaki Street intersection (12 cables)
- Taranaki and Wakefield Street intersection (20 cables)
- Manners Mall (5 cables)
- Willis and Mercer Street intersection (10 cables)

Additionally manholes are on all intersections over the proposed route. Manholes are expensive - Telecom estimated that diversion would cost

Plate 4: Trams in Willis Street

Picture courtesy of Graham Stewart

between $250,000 and $500,000 per manhole. Work undertaken in Lower Hutt (Melling Link) in 1993 to divert eight cables and demolish one manhole cost $190,000. Telecom considered that the Melling link would be similar to the tram proposal but at more than one point.

Cityworks estimate the cost of diverting services to range from $500 per metre for small diameter sewers to thousands of dollars per metre for the large stormwater culverts, an added complication is that it is not possible to simply divert a pipeline as the grade and location of other services needs to be taken into consideration.

Cityworks does not expect to experience any betterment from diverting the drains as the drainage system in the vicinity of the route has been recently upgraded. Ongoing maintenance will be required but no major rehabilitation is proposed for many years.

Cityworks also notes that it encounters the remains of the past tram system occasionally: "the reinforced concrete slabs are still in many streets and the extra cost involved in excavating through this is at times considerable".

Cityworks costs were estimated at:

Phase I	$	95,000
Phase II	$	983,400
Total	$	1,078,400

Wellington City Council Traffic Signals costs (and measures) are described in the traffic management section. The costs were estimated at:

Phase I	$	91,269
Phase II	$	108,731
Total	$	200,000

Wellington City Council Parks & Recreation considered that so long as the tram keeps to the road and does not infringe on any pavement horticulture, no costs to sprinklers, water systems, plants or trees would be incurred.

Wellington City Water (WRC) provided comments on the Grey Street - Queens Wharf section. Costs for water service diversion were estimated at:

Phase I	$	0
Phase II	$	983,400
Total	$	983,400

The tram route would need to be clear of watermains where parallel runing to allow for access to pipes for leakage repairs or for making connections. Pipeline connections would be satisfactory. Preliminary inspections for the Grey Street - Queens Wharf section suggested that it would unlikely that water mains would need to be repositioned. If diversion was necessary, WRC foresaw no opportunity for betterment. Pipeline relay costs were of the order of $250 per lineal metre and repositioning of valves/hydrants would cost approximately $1,000.

3.9 Track Costs By Section

Track costs were broken down into six sections. The most expensive section was Cable Car - BNZ. The cheapest section by virtue of negligible service diversion costs was Cable Car - Queen's Wharf. The costs per kilometre range from just under $1 million (Q.Wharf-Museum) to $5.2 million (Cable Car - Queen's Wharf).

Table 3.9: Track, Overhead, Station & Service Diversion Costs
Thousand Dollars 1993 Prices

	Section Length (m)	Track, O.H., & Stations	Service Diversion	Total	Cost Per km
Cable Car-Q.Wharf	190	224	578	802	4,221
Q.Wharf-Museum	650	592	5	597	918
BNZ-Civic Square	240	461	635	1,096	4,567
Civic Square - Cuba St	320	471	725	1,196	3,738
Cuba St - Museum	480	468	1,045	1,513	5,043
Cable Car – BNZ	300	287	1,283	1,570	5,233
Total	2,180	2,502	4,392	6,894	3,162
By Phase:					
Phase I	840	816	583	1,399	1,665
Phase II	1,340	1,686	3,809	5,495	4,101

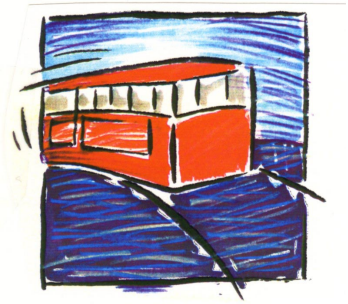
Douglas Economics

3.10 Track and Overhead Maintenance

Annual track maintenance was estimated at $138,000 based on maintenance costs equally 2% of construction costs. Overhead wiring maintenance was estimated at $39,000 p.a. assuming maintenance costs would be 5% of installation costs. The annual labour cost of maintaining the seventy kilometres of trolley bus wiring in 1993 was $500,000 which implied $14,000 for the 2 km loop. Compared to trolley buses, trams would probably require less overhead maintenance because of their fixed path. Most trolley problems are in the city centre and suggested the cost of $39,000 to be reasonable. Tram and trolley overhead maintenance could be integrated to confer cost savings. In 1993, the trolley bus system required 24 hour manning and it was considered that the same staff could also look after the tram wiring. No maintenance costs were assumed for the first five years. The total annual estimated maintenance cost (track and overhead wiring) was $129,000 over the sixteen years of revenue operation.

Plate 5: Tram along Lambton Quay

Photo courtesy of Graham Stewart



4. Tram Vehicles

4.1 Rolling Stock Requirements

Phase II would require four trams to provide a service every ten minutes in both directions. An additional spare vehicle would also be necessary. The capital costs of tram purchase were estimated at $2.1 million. *Phase I* would require two trams.

It was considered that a mixture of authentic Wellington trams and imported trams should be used. Hongkong was considered the most likely source and could deliver within six months. The recommended mix was two Wellington trams and three imported Hongkong trams. One tram should cater for the infirm, disabled and those with prams. Restoring a Wellington tram would cost $300,000 and the Hongkong trams would cost $500,000 (CIF) each.

4.2 Local or Imported

Suitable vehicles for the Tramway could be obtained in one or more of the following ways:

- Use of Authentic Wellington Trams
- Purchase of Second Hand Trams
- Construction of replica vehicles
- Borrowing suitable vehicles

The Wellington Tram Museum was supportive of restoring trams for use in Wellington city. Market research also found a strong preference for authentic Wellington trams. The service should therefore feature at least one authentic refurbished Wellington tram.

Complete restoration to city running standards would cost around $300,000 per tram. There would be a need for a bogie swap facility (3'6" to replace 4') rewiring and strengthening.

It would not be wise to rely on Wellington trams alone. The Museum had only ten vehicles: 4 good, 4 medium and 2 with bodies only. All these vehicles together might be sufficient to operate a base service but would leave insufficient spares for peaks or maintenance. Continuous use of all these vehicles would involve either a rapid deterioration of the stock or a very high maintenance commitment. Use of all the available vehicles for a downtown tramway would mean the abandonment of the existing museum, which the Wellington Tramway Museum might not be willing to contemplate.

The Wellington trams have mechanical and electrical equipment of Edwardian design, offering performance below what is likely to be acceptable for daily service downtown in the 1990s.

The Museum also expressed concern about any modifications being made (e.g. regauging) which would reduce the authenticity of the trams. Safety and manning would also be a key consideration in the choice of tram. Some Wellington trams have centre as well as exits at the ends of the cars which would make it difficult for single person operation necessitating conductors. Step heights would also make boarding and alighting for the old, infirm, disabled difficult.

With regards the purchase of second hand trams, reconditioning and regauging from 1000 mm to 1067 mm would be required in most cases. Most trams would probably be of post-war (1950s or 1960s) design which would not offer the same nostalgia as older vehicles, but would offer more comfortable vehicles with performance characteristics more suited to modern traffic.

A list of narrow gauge tramways was compiled from Janes Urban Transport Systems by Brent Efford of Transport 2000. All are metre gauge unless stated.

Table 4.2: Narrow Gauge Tramways

Antwerp	PCC cars, being modernised
Augsburg	All modern
Basle*	Major purchase of low floor cars proposed, to replace old stock.
Belgrade	
Bern*	Has some stock dating from 1947.
Bielfield	
Bochum*	Modernising
Charleroi	All new
Essen*	Metre gauge lines being converted to standard.
Geneva	All new
Hong Kong*	Traditional style double deck cars, 1067 mm gauge. To be replaced as part of an expansion programme.
Krefeld	All new
Lille	All new
Lisboa	900mm gauge. Old style cars. Supplied vehicles for Detroit.
Lodz*	Old style cars shown in photo. 639 cars in fleet, 502 in peak service.
Mannheim-Ludwigshafen	All new
Okayama	1067 mm gauge tramway, 8x 1953 vintage vehicles
Sofia	1009 mm gauge tramways being gradually converted to std gauge. Numerous older articulated cars apparently to be disposed of.
Stuttgart*	Metre gauge tramways being converted to std gauge until 2000.
Zagreb	71 two axle and numerous four axle cars.
Zurich*	96 pre-1960 cars

Source: Janes Urban Transport Systems

A survey was sent out to the eight Tramways (asterisked in Table 4.2). Four replies were obtained. Basle and Essen had no trams to sell. Hong Kong and Bern were willing to supply trams.

Bern had fifteen trams dating from 1947 - 1960 or metre gauge some of which could be available for sale after 1998. The trams seat 27, weigh 18t and have four axles. They have four motors, use 600 Volt AC (4 x 54 kW) and have a minimum curve radius of 14.5 metres.

The bogies have resilient wheels with primary and secondary suspension; Bern considers that a regauge to 3'6" would not be difficult.

The cost of a tram FOB was $NZ 17,800 (SFr 20,000). Shipping would probably be $NZ 100,000. The trams would need to be modified and regauged which would probably cost $150,000. The total cost would therefore be around $270,000.

Spare parts were available from their stock but supplies from manufactures were estimated to be expensive. Bogies and/or electrical equipment could be supplied on their own. The price of complete set of mechanical spares FOB was $NZ 26,600 (SFr 30,000) which was more than for a complete tram.

Hongkong Tramways Ltd have been in existence since 1904 and operated 161 standard double deck trams in 1993 which carry 345,000 passengers daily, plus two open balcony vintage style tourist trams. Even with heavy loadings they achieve a 97% availability rate due to the trams sturdy and reliable construction.

Hongkong Tramways Ltd supplied two new double deck tramcars based on a 1949 designed body to the Wirral Heritage Museum in Birkenhead England in late 1992.

The stated dimensions of the Hongkong trams were 3'6" gauge and the trams were fitted with trolley pole current collection which would make them suitable for sharing the overhead system with Wellington's trolley buses. Hongkong considered that their trolley pole and pantograph operation could be compatible with a Light Rail (Melbourne was cited as an example).

New and old trams would cost the same. Ex works, the cost would be HK$ 1.7 million (approx $NZ 400,000). Shipping would probably raise the cost to $NZ 500,000.

A complete set of mechanical parts (1 truck (no accessories, brakes etc) 1 motor, controller parts, valves, seats, lights and 24VDC converter would cost HK$ 320,000 ex work; NZ$75,000.

The trams weight 11.5 ton are built of teak wood and are single unit, 2 axle, two directional, and double deck trams. Single deck units could be manufactured. The trams seat 42 (26 upper; 16 lower).

Body lifes were estimated at six years for their 1991 trams (low due to the heavy usage 2,300 passenger journeys per tram day and maintenance versus rebuild costs.

Various electrical motors were available (2x25Kw; 2x40Kw & 2x50Kw).

The wheels were considered resilient with straight or helical gears available. The minimum curve radius was 36' (inside rail).

Trams could be supplied within six months of signing a purchase agreement.

A third option would be to construct replica trams. Mechanical and electrical equipment purchased from overseas could be used to construct replica trams. This option would give the greatest flexibility and provide vehicles with an historic appearance yet with performing closer to modern requirements.

At the time of the study there was little local capacity to build authentic wooden bodied vehicles on a commercial basis. Although various tramway and railway museums do restore old vehicles using voluntary labour, they did not have the capacity to build a quantity of replica vehicles within a reasonable time. An alternative would be to co-ordinate the skills of other industries such as heavy engineering and boatbuilding. This would however require a high level of project management and engineering skill. Custom built vehicles would be likely to cost more than $500,000 each, even assuming that mechanical and electrical parts can be imported cheaply.

A fourth alternative would be to borrow suitable trams. Trams could be borrowed from systems such as Hong Kong or Museum Tramways overseas. Such trams would have little direct relevance to Wellington but would have considerable novelty or cosmopolitan interest. Sponsorship to cover part or all of the costs involved might be a possibility. It is unlikely that the Tramway could rely on this source of vehicles alone.

Plate 6: Old Wellington trams are not easy to board or alight.

Photo by Neil Douglas

4.3 Catering for the Disabled and Infirm

Old trams are difficult to board and alight for old and disabled people or people with prams; step heights are high for example. Therefore at least one tram should be designed specifically to cater for the infirm and disabled.

4.4 Tram Operating. Maintenance and Management Costs

Phase I (1996) operating, maintenance and management costs are estimated at $457 thousand in 1996 rising to $582 thousand.

The costs comprise:

- Drivers wages
- Electrical power
- Management expenses
- Tram maintenance

Wages and electrical power costs assumed the Tramway would operate sixteen hours per day from 7am to 11pm (365 days per year). This gives 23,360 operating tram hours per year.

Drivers wages are estimated at $151 thousand per year for the complete loop (1996 onwards) based on a gross hourly wage rate of $13.

Electrical power is estimated at $231 thousand for Phase I and $43 thousand from 1996 onwards; this is based on a rate of $1.84 per tram operating hour supplied by *Capital Power*.

Management fees (one full time manager, a secretary and associated administration cost) are estimated at $100 thousand per year

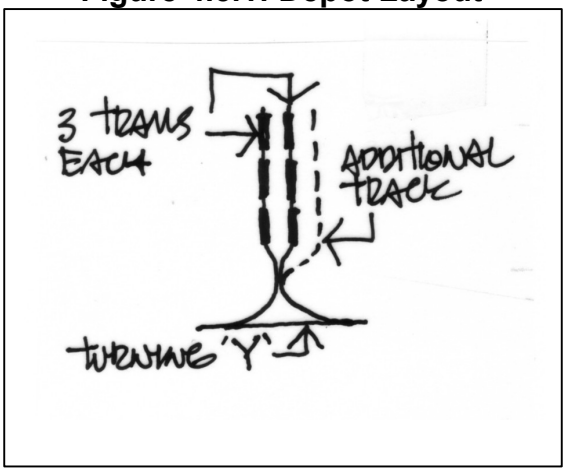
No tram maintenance is assumed necessary for five years. Then, a cost of $125 thousand (25 thousand per tram) is budgeted. The maintenance cost was based on a complete overhaul every five years costing $125,000 (information supplied by the *Wellington Tramway Museum*).

4.5 Depot Requirement

Trams will need to be housed at night to stop vandalism and provide an area for minor maintenance. The cost for the depot is estimated at $1 million. (based on Christchurch figures)

The depot could be a temporary building until the full loop is completed. The Free Ambulance building is a possibility but is fairly small. Alternatively, a spur to the north could be built to utilise one of the wharf sheds opposite the Waterloo Hotel.

Figure 4.5.1: Depot Layout



Drawing by Daryl Cockburn

The minimum requirements would be (i) two tracks to separate trams which are 'running' from those undergoing maintenance and (ii) a pit long enough to permit overnight maintenance on any tram, Figure 4.5.1.

4.6 Full Cost Schedule

A full cost schedule by year and item is presented in Table 4.6.1.

Table 4.6.1: Cost Schedule (Thousand Dollars 1993 Prices)

Year	Track	Cons Fees	Depot	Trams	Track Maint	OH Maint	Tram Maint	Manag Fees	Driver Wages	Elect Power	Total
1994	1,399	300	400	1,000							3,099
1995	5,496	350	600	1,100				110	304	21	7,829
1996								110	304	43	457
1997								110	304	43	457
1998								110	304	43	457
1999								110	304	43	457
2000					86	39	125	110	304	43	707
2001					138	39	125	110	304	43	759
2002					138	39	125	110	304	43	759
2003					138	39	125	110	304	43	759
2004					138	39	125	110	304	43	759
2005					138	39	125	110	304	43	759
2006					138	39	125	110	304	43	759
2007					138	39	125	110	304	43	759
2008					138	39	125	110	304	43	759
2009					138	39	125	110	304	43	759
2010					138	39	125	110	304	43	759
2011					138	39	125	110	304	43	759
Total	6,895	650	1,000	2,100	1,603	468	1,500	1,870	5,011	709	20,266

Plate 7: Trams at the Taranaki and Dixon Street Intersection

Photograph courtesy of Graham Stewart

5. Ridership and Revenue Projections

5.1 Tourist and Local Demand

Demand for the tram would originate from four main sources:

- Visitors to Wellington - International and Domestic tourists and business visitors who may use the tram to 'get about' or use the tram as a 'visitor attraction' in its own right;
- Visitors to Lambton Harbour who may use the tram to visit the development or as part of their visit;
- Pedestrians – people currently walking along the route who many opt to use the tram instead of walking
- Bus users who may divert to the tram for all or part of their journey

Forecasts were produced for each trip category then summed to give total patronage. Although there is some overlap between the four categories (an international visitor may be a pedestrian for example) the extent and impact of any 'double counting' is considered negligible

Leisure trips by Wellington residents generated by the Tramway are not included in the forecast. Generated patronage could be significant especially in the first year. It is recommended that this source of patronage could be assessed by a telephone or household survey.

Forecasts were produced for sixteen years. Phase I was assumed to be operational in 1995 and Phase II in 1996. It should be noted that the patronage forecast would be largely unaffected by later opening dates.

The forecasts were based on desk-top research and interview surveys. Three elements comprised the patronage forecast:

- Total size of the source markets in 1993 (M)
- Forecast growth rate in the market forecast year compared to 1993 (g)
- Probability of Tram use (p)

The forecast patronage (Q) was of the following form: Q = M.g.p Forecasts were produced for different fare and service levels. The central case assumed a $1 fare and a tram every ten minutes.

5.2 Patronage Forecasts

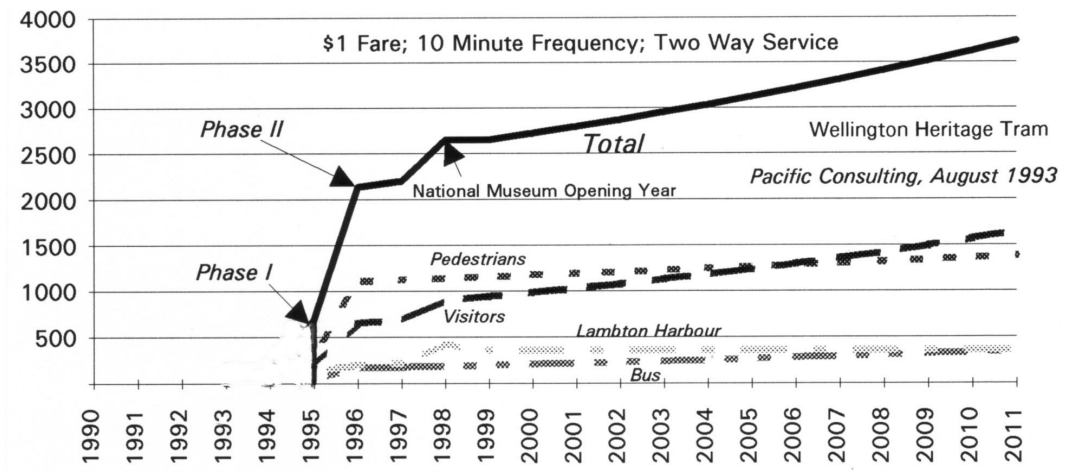
Phase I (Cable Car to the Museum) was forecast to achieve just under 700 thousand trips in 1995; equivalent to 1,900 trips per day (/365). The ridership was therefore forecast to be equivalent to the use of the cable car (700,000 in 1993) and just under 50% of central city bus ridership (1.5 million trips per year).

Each tram service was forecast to carry twenty passengers on average (assuming daily operation every 10 minutes between 7am and 11pm).

Phase II was projected to achieve 2.1 million trips in 1996 – the first full year of operation and 3.7 million in 2011. Trips were forecast to grow at an annual rate of 3.8%.

In 1995,, the tramway was forecast to achieve a ridership three times that of the Cable car (1993 levels) and 40% more than central city bus patronage. Each tram service was forecast to carry thirty passengers. The average load factor was forecast to be around 15% in 1996 and 28% in 2011 assuming each person travels a third of the route and Hongkong trams (42 seats) are used. The patronage forecast is presented in Figure 5.2.1.

Figure 5.2.1: Patronage Forecast



Pedestrians and visitors were forecast to make up 80% of ridership (averaged over the sixteen revenue years). Each contributed about 40% of trips (see Table 5.2). Visitors to Lambton Harbour and diversion from bus were forecast to contribute the other 20%.

Pedestrians represent 56% of the total potential market. Bus users represent the next biggest market (20%) with the two visitor categories contributing just over 10% each.

Around 20% of the potential market is forecast to use the Tramway. A ridership rate of 73% is forecast for visitors. Of course, visitors may use the tram more than once during their stay in Wellington so if two tram trips per visitor are made, 36.5% of visitors are implied to use the tram.

Much lower usage of 20% of less is forecast for the other three categories. One in five visitors to Lambton Harbour are forecast to use the tram, 16% of pedestrians are forecast to use the tram instead of walking and 9% of bus users are assumed to divert to the tram.

Table 5.2: Patronage Summary
Per average revenue year (trips in thousands)

	Total Market Size	Tramway Trips	Percent Using Tramway	Percent of Tramway Usage	Percent of Total Market
Pedestrians	7,956	1,260	16%	42%	56%
Visitors	1,600	1,173	73%	39%	11%
L. Harbour	1,713	349	20%	11%	12%
Bus	2,863	253	9%	8%	20%
Total	14,132	3,036	21%	100%	100%

Assumptions: fare $1; service every 10 minutes

5.3 Revenue Projection

Including advertising and sponsorship ($125,000 in the first full year, see section 5.7), the Tramway is forecast to earn $663 thousand in 1995 (Phase I) and just over $2 million in 1996 – the first full year of operation ($1 fare and 10 minute service). Revenue is forecast to rise to $3.5 million in 2011 (an annual growth rate of 3.8%).

Averaged over the sixteen years of revenue operation, the net annual revenue is $3.2 million.

The Net Present value (NPV) of the revenue stream, discounted at 9% is just under $21 million

Pedestrians and visitors account for three quarters of revenue: Lambton Harbour visitors and bus diversion contribute 20% and advertising and sponsorship 6% (see Table 5.3).

Table 5.3: Revenue Summary
(1993 thousands dollars excluding GST)

	Undiscounted (1)	NPV at 9%	Percent of NPV at 9%
Pedestrians	1,260	8,451	41%
Visitors	1,713	7,284	35%
L. Harbour	349	2,345	11%
Bus	253	1,594	8%
Advertising	159	1,161	6%
Total	3,195	20,836	100%

Assumptions: fare $1; service every 10 minutes
(1) Undiscounted is average per revenue year

Sketch: Tram in Manner Mall from Victoria Street to Cuba Street

Daryl Cockburn

5.4 Alternative Fares and Service Levels

From a farebox revenue perspective, the optimal fare and frequency combination would be a $1 fare with services departing every five minutes. From an operational perspective, a ten minute frequency would be optimal however.

Table 5.4: Sensitivity of Patronage to Fare and Frequency

Patronage (thousands per average revenue year)					
	Fare Level				
Frequency	Free	50c	$1	$1.50	$2
5mins	6,621	6,283	5,122	3,120	1,268
20 mins	3,942	3,737	3,036	1,801	706
15 mins	1,420	1,346	1,094	672	269
20 mins	598	569	468	303	133

Revenue (thousands of dollars per average revenue year excluding GST)					
	Fare Level				
Frequency	Free	50c	$1	$1.50	$2
5mins	-	2,792	4,553	4,160	2,254
20 mins	-	1,661	2,699	2,402	1,255
15 mins	-	598	972	895	478
20 mins	-	253	416	403	237

Note: excludes advertising and sponsorship revenue

A service every five minutes would require eight trams on the loop simultaneously. Without double tracking the entire loop, the operational problems associated with four passing loops in Wellington City Centre mitigates against five minute services.

Patronage was forecast to be sensitive to fare and service level. With services every ten minutes, a $1 fare was forecast to lose half the ridership compared to 'free' fares. Increasing

fare from $1 to $1.50 loses a further 40% of patronage (implying a fare elasticity of -0.8) with revenue declining by around 10%.

At a $1 fare, reducing the frequency to every 15 minutes (from ten minutes) reduces patronage by 64% (a service interval elasticity of -1.28). These outcomes are considered to reflect walking being a close substitute and tram usage being discretionary.

5.5 Pedestrian Market

The size of the potential pedestrian market for 1993 was estimated at 5.84 million trips. Pedestrian traffic was forecast to grow at 1.5% a year to reach 7.6 million in 2011.

Courtenay Place to Lambton Quay is the key pedestrian route. The highest hourly counts were at Manners Mall / Cuba Street with 3,800 per hour (roughly equivalent to one per second) during the afternoon (midweek).

Pedestrian counts were undertaken at Grey St / Lambton Harbour; BNZ Cnr Willis / Lambton Quay; Library Corner; Manners Mall / Cuba St and Taranaki / Courtenay Place. Pedestrians moving in both directions were counted over five to ten minute periods between midday and 6.15pm on a sample of midweek days. Table 5.5 presents the results alongside comparative figures estimated by the New Zealand Institute of Valuers (NZIV).

Table 5.5: Pedestrian Count – Numbers per hour (1993)

Pedestrian Count	Douglas Economics	NZIV
Grey St / Lambton Harbour	1,314	330
BNZ Cnr Willis / LQuay	3,635	1,605
Library Cnr Victoria / Mercer St	2,297	-
Manners Mall / Cuba St	3,784	1,199
Taranaki / Courtenay Place	1,900	430

Source: Douglas Economics (formerly Pacific Consulting)
NZIV: New Zealand Institute of Valuers

It is recommended that more counts be undertaken since the NZIV figures were roughly half those obtained by Douglas Economics.

The lower NZIV figures were used in forecasts. The potential pedestrian market in 1993 was estimated at 5.84 million trips (1,600 (highest NZIV count) x 10 hours x 365.

5.6 Domestic and International Visitors

Tramway forecasts were pivoted on Cable Car patronage. The market research estimated the relative usage the Tramway would achieve relative to the Cable Car (see section 5.6).

In 1993, the Cable Car was estimated to carry 700,000 passengers of which 265,000 were assume to be visitors (Management estimates). It is recommended that a survey be undertaken to substantiate this estimate.

Visitor patronage of the Cable Car was projected over the project period by reference to the forecast of visitor numbers to Wellington

The New Zealand International Visitor Arrival Forecast (1991/92) provided forecast up to 2000 which were extrapolated to 2011 by Douglas Economics. Three scenarios are provided: high, medium and low growth. Table 5.5.2 sets out the assumptions. The medium scenarios were used in the forecasts.

Table 5.6: International & Domestic Wellington Visitor Growth Rates

Growth Scenario	International (1)	Domestic (2)
High	10%	4%
Medium	7%	3%
Low	4%	1%

Source: (1) NZ International Visitor Arrival Forecasts
(2) Douglas Economics

5.7 Lambton Harbour

In 1992/93, Lambton Harbour attracted just over half a million visits that were considered of potential to the Tramway. By 1999, the figures were projected to rise to 1.4 million. The forecasts assumed no further growth in Lambton Harbour patronage after 1999. All the forecast exclude current Lambton Harbour car parkers.

Current restaurant and retail activity (Dockside, Shed Five and the Fish Market) attract around 320,000 visits a year. Information supplied by Colliers Jardine suggest that the full restaurant and retail complex could more double this by 1998 to total 700,000 trips a year.,

Special events on the Harbour attracted 89,000 during the year 1992/93 (excluding Mobil 2000 (a waterfront car race) during which period, the tram would not operate along the harbour). The Events Centre, assumed to open in 1995 was forecast to generate 337,000 trips.

Table 5.7: Lambton Harbour Visits

Year	Attractor / Generator	Potential Tramway Trips
1993	Shed Five, Dockside Fish Market	320,000
	Special Events	189,000
	Total	509,000
1994	Queens Wharf Apartments	70,000
	Total	579,000
1995	Events Centre	337,000
	Total	916,000
1998	National Museum	800,000
	Total	1,716,000
1999 on	National Museum	500,000
	Total	1,416,000

The Queens Wharf apartments were forecast to generate 70,000 potential Tramway trips a year from 1994 onwards.

The new National Museum was forecast to generate 800,000 trips in the first year (1998) and 500,000 thereafter.

No trips are included for the hotel planned for the Harbour, Marina, Chaffers Beach apartments or New World supermarket. No allowance was made for the Interislander Terminal being moved to Glasgow Wharf nor the possible development of the National Football Stadium at the rail yard site. Table 5.7 sets out the forecast for Lambton Harbour potential market estimate.

5.8 Diversion from Bus

Stagecoach estimated that 1.5 million trips were made by bus in 1993 which could be considered divertible to the Tramway. City bus patronage was assumed to grow by 0.5% a year to reach 1.64 million trips in 2011.

5.9 Diversion Rate Factors

The market research estimated (i) the percentage of people who would consider using the tram; (ii) the fare they would be willing to pay and (iii) how frequency the tram would need to operate. Table 5.9 presents the diversion factors used to produce the forecasts.

Table 5.9: Diversion Rates by Market

	Visitors		Lambton		
	Business	Leisure	Harbour	Pedestrians	Bus
Maximum Divertible					
Without L.H.	.57	.62	.22	.52	.14
With L.H.	.57	.87	.22	.52	.14
Fare (Single Fare)					
Free	1.0	1.0	1.0	1.0	1.0
50c	1.0	1.0	.92	.96	1.0
$1	.86	1.0	.67	.81	.90
$1.50	.57	.87	.33	.18	.18
$2	.29	.69	-	.04	.04
$2.50	.29	.69	-	-	-
Frequency (Services every X mins)					
5 mins	.94	.94	.92	.94	1.0
10 mins	.52	.52	.75	.52	.86
15 mins	.20	.20	.25	.20	.14
20 mins	.20	.10	-	.10	-
25 mins	-	-	-	-	-

With a fare of $1 and a ten minute service, 22% of pedestrians were forecast to sue the Tramway (0.52 x 0.81 x 0.52 x 100).

The forecast took account of more leisure visitors considering the Tramway with the Lambton Harbour development than without (87%) versus (62%). Visitors were posed with a $2 fare when asked whether they would consider using the Tramway – the forecast pivoted around this fare.

5.10 Survey Program

Just over two hundred people were interviewed to gauge the demand for the Tramway. The general findings of the survey were:

- People were enthusiastic a bout a Heritage tram service
- Ridership would be sensitive to frequency and fare
- Two way operation, a dollar fare and a service every ten minutes was the preferred option
- Visitors would be prepared to pay to use the service – a day ticket at $6 would be used
- A popular package would be a tram ride with a visit to Lambton Harbour
- Authentic Wellington trams were preferred to imported trams - at least one Wellington tram should be included in the fleet
- The surveys should be increased to improve survey accuracy

Four surveys were undertaken, Table 5.6.1 presents the sample sizes achieved by each survey.

Table 5.10: Survey Sample Sizes

Survey	Sample
Visitors to Wellington	35
Visitors to Lambton Harbour	55
Pedestrians	56
Bus Users	57
Total	203

Plate 8: Daphne Hercus - a visitor to Lambton Harbour is interviewed by Kate Miller

Photo by Neil Douglas

- Slightly over one in five would use a tram instead of walking if the tram ran every ten minutes and a fare of $1 was charged.

- Pedestrians would make two thirds more trips by the tram per week than they currently make by bus if the tram fare was $1 and the service ran every ten minutes.

- Three quarters of respondents had a strong preference for an authentic Wellington tram.

5.12 Wellington Visitor Survey

- The most visited attraction in Wellington was the Cable Car with 60-70% of leisure visitors having made or were intending to make a trip. The East by West Ferry attracted 10-14% of leisure visitors. Sightseeing buses were less popular with 10%.

- A Heritage Tram would be as popular as the Cable Car amongst leisure travellers.

- Nearly 60% of business visitors said they would use a tram service around town whereas few use the Cable Car.

- Amongst all visitors, the tram would be 50% more popular than the Cable Car (if priced at $2 per trip and $6 for a day ticket).

- The tram would benefit from the Harbour Development. Tram leisure usage rose with the development:- the comparative percentages were 62% without Lambton Harbour and 80% with the Development. The business usage percentage did not rise however suggesting a tendency amongst business men to use the tram around town rather than to the Development.

- 50% would purchase a $6 day ticket and 50% a $2 single ticket.

- Seventy percent had a strong preference for an authentic Wellington tram over an imported tram.
-

Plate 9: The Wellington Cable Car – Wellington's most visited tourist attraction – surveys suggest a tram could be even more popular

Photograph by Neil Douglas

5.13 Lambton Harbour Survey

- 11% of Lambton Harbour visitors would use a tram to access Lambton Harbour if priced at $1 and running every 10 minutes
- A higher percentage would use the tram 'once their' either as part of their visit or to go on from Lambton Harbour to their next destination.
- Visitors expected to make use of the tram 0.74 times a week which was twice their current use (0.39) of buses in the central city (if the tram was priced at a dollar and ran every ten minutes).
- Visitors had a preference for authentic Wellington trams.

5.14 Bus Survey

- Between 9% and 19% of bus passengers would consider diverting to the tram.
- If the tram ran every ten minutes, 86% who considered the tram would use it.
- Seven out of ten of those who considered the tram would pay more than the bus fare to use the tram
- Bus users had a very strong preference for an authentic Wellington tram (97%).

5.15 Advertising and Sponsorship

Saatchi and Saatchi Advertising provided an assessment of the sponsorship and advertising potential of the Tramway. They considered that the rate/ cost for a sponsor would be demand driven and negotiable. A benchmark is provided by the average figure of $12,000 obtained by Stagecoach for a totally painted bus for a year. Heritage trams would be considered a 'premium product' and *Saatchi and Saatchi* estimated annual revenue of $25,000 per tram. With five operational vehicles (including the spare which would share time), a total revenue of $125,000 could be achieved per year. Sponsorship revenue would be likely to grow in line with patronage of the tram.

Saatchi and Saatchi also made the following points:

- Quality control will be very important (i.e. all signage must be maintained to a high standard)
- Advertising should be selective - the sponsors should fit in with the image, uniqueness and attraction of the trams
- Sponsors should preferably be Wellington based
- Actual advertising should be in keeping with the "look" and style of the tram and the waterfront (i.e. authentic and heritage)
- The sponsor package should include all outside signage on the tram - only the inside should be sold to smaller interests

6. Financial Appraisal

6.1 Overall Assessment

Bruce Piunti of Miller Dean & little Chartered Accountants reviewed and commented on the analysis. The Tramway is forecast to be profitable. Before tax, the internal rate of return for the Tramway was 19%. At an interest rate of 9%, the financial benefit – cost ratio was around 1.5: for every dollar spent $1.50 of revenue was earned.

The net present value of the revenue stream was estimated at $20 million, 5.7 million more than the cost stream (at 9%). Including an opportunity cost of capital (at 9%), the pay - back was 2007- thirteen years after construction. Table 6.1 presents the schedule of costs and revenues by year. Two analyses are presented: undiscounted (including an interest charge on capital of 9%) and discounted at 9%. Figure 6.1 presents the revenue and cost projections.

Table 6.1: Revenue and Cost Analysis

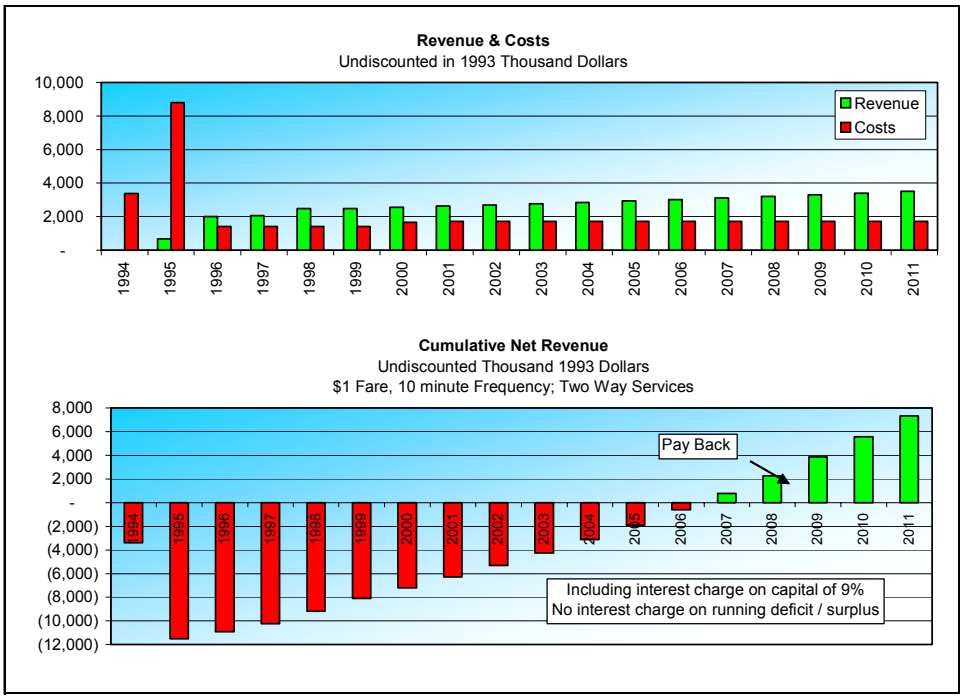


Table 6.2: Revenue and Cost Analysis

Year	Undiscounted Analysis			Discounted Analysis		
	Revenue Excluding GST	Costs Including Interest	Net Revenue	Costs Excluding Interest	9% Discount Factor	Discounted Net Revenue
1994	-	3,377	(3,377)	3,099	1.00	(3,099)
1995	663	8,787	(8,124)	7,829	0.92	(6,593)
1996	2,006	1,415	591	457	0.84	1,301
1997	2,070	1,415	655	457	0.77	1,242
1998	2,490	1,415	1,075	457	0.71	1,443
1999	2,491	1,415	1,076	457	0.65	1,322
2000	2,557	1,665	892	707	0.60	1,110
2001	2,626	1,716	910	759	0.55	1,027
2002	2,698	1,716	982	759	0.50	970
2003	2,773	1,716	1,057	759	0.46	926
2004	2,852	1,716	1,136	759	0.42	879
2005	2,934	1,716	1,218	759	0.39	848
2006	3,020	1,716	1,304	759	0.36	814
2007	3,110	1,716	1,394	759	0.33	776
2008	3,204	1,716	1,488	759	0.30	734
2009	3,303	1,716	1,587	759	0.27	687
2010	3,406	1,716	1,690	759	0.25	662
2011	3,514	1,716	1,798	759	0.23	634
Total	45,717	38,365	7,352	21,812		5,683

Plate 10: Trams in Manners Street (now Manners Mall)

Photo courtesy of Graham Stewart

6.2 Project Bankability

Richard Somerville of *Southpac* assisted in the preparation of this assessment.

Profit before interest and tax in the first full year of operation (1996) was forecast at $880 thousand. In year six (2001) when operating costs stabilise at $760 thousand per year, profit before interest and tax was forecast at $1.21 million – see Table 6.2.1.

Table 6.2.1: Revenue-Cost Analysis of Capital Investment

	First Full Year 1996 $m	Year 6 2001 $m
Revenues	2.00	2.63
Operating Costs	0.46	0.76
Depreciation	0.66	0.66
Earnings Before Interest & Tax	0.88	1.21

	Cost $ million (1993)	Asset Life years	Depreciation $m
Tram Costs	2.1	20	0.11
Track Construction	6.7	30	0.22
Depot Purchase	1.0	30	0.03
Profession Fees	0.5	10	0.15
Contingencies	0.5	10	0.15
Total	10.8	-	0.66

Douglas Economics & Southpac

Four project characteristics could tend to work against structuring the project with any significant debt element:

- The unproven nature of the project
- The sensitivity to patronage and revenue per ride
- Further uncertainties surrounding the initial capital cost of the project and the ongoing operating costs
- The specialised nature of most of the project's assets.

These project characteristics will tend to mitigate against structuring the project with any significant debt element.

Debt financing of the project may only be available to the project company if shareholders underwrite the performance of the business in the absence of any hard evidence to support the revenue and cost outcomes and the initial capital costs.

This underwrite is tantamount to a guarantee of the project's outcome does not materialise (i.e. there is either an overshoot of capital expenditure, operating costs or an undershoot in revenue or both) the shareholders would be obliged to contribute cash to the project company in order to ensure that the stability of its financial position is preserved.

The adoption of a 50/50 debt/equity ratio would result in an operating cash flow sufficient to meet any other working capital requirements that may arise and to repay the debt raising over an appropriate time period – see Table 6.2.2.

Tax paid profit is forecast at $0.29 million in 1996 and $0.6 million in 2001.

Return on equity could be 5.8% in 1996 and around 10% in 2000. These returns would be fully imputed dividens i.e. shareholders pay no more tax. It would be unlikely however for dividends to be paid out at the full rate in early years.

Table 6.2.2: Profit Outcome with 50/50 Debt/Equity Ratio

	First Full Year 1996 $m	Year 6 2001 $m
Earnings before Interest and Tax	0.88	1.21
Debt ($15 million @ 8%)	0.45	0.31
Pretax Profit	**0.43**	**0.90**
Taxation	0.14	0.30
Tax Paid Profit	**0.29**	**0.60**
Plus Depreciation	0.66	0.66
Subtotal	**0.95**	**1.26**
Operating Cashflow	0.32	0.32
Operating Cashflow	**0.63**	**0.94**

Loan Repayment of $5 million over 16 years
Company tax at 33%
Douglas Economics & Southpac

It is important to stress again that this assessment is meaningless unless a high level of confidence in the projected performance of the business can be gained. Moreover, the foundation shareholders are more likely to gain this level of confidence than the debt markets. Accordingly, the obvious alternatives for the promoter shareholders would be to:

- Totally finance the project from their own resources (equity and/or shareholder advances).

- Provide some level of support (underwrite/warrant the performance of the business etc) to the business in order to secure banking for the project.

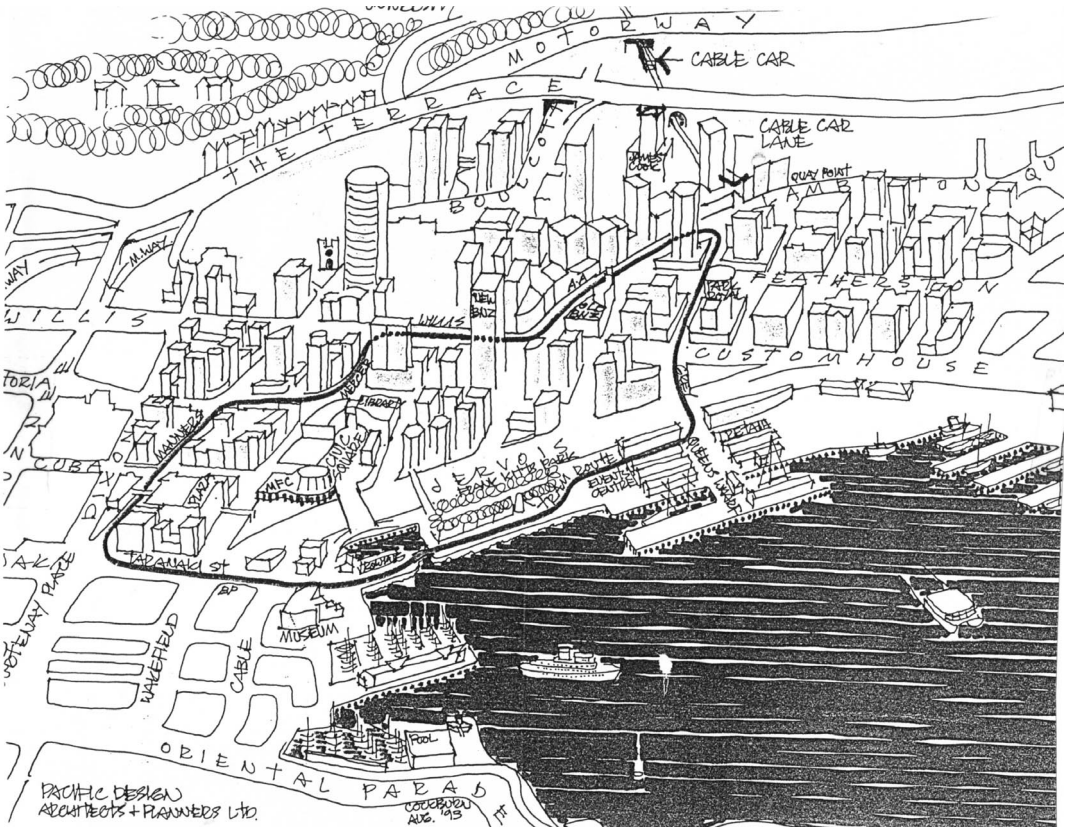
Whilst the latter cuts across a fundamental banking maxim (that a project should stand alone from a banking perspective and that a test of the commerciality/bank ability of a project by the debt markets is usually a conservative but honest test) shareholder support may be necessary.

Such shareholder support could be justified if:

- Shareholders have more confidence in the project than bankers

- Shareholders gain other tangible/intangible benefits from seeing the project move ahead and these benefits crystallise outside of the project company (eg in the case of Lambton Harbour this project accelerates the development of the waterfront area, or in the case of WCC, traffic pollution and noise is reduced in the Lambton Quay area to the benefit of shop owners and the Wellington public in general)

Sketch 2: Tramway Route Map



Sketch by Daryl Cockburn

7. Traffic Management Issues

7.1 Summary of WCC Analysis

Wellington City Council Transportation and Design undertook a traffic management appraisal of the Tramway as an input into this study. Their main analysis assumed one way operation; a subsidiary analysis assessed two way operations.

The WCC consider the proposed loop route to be *"a viable route for the proposed Historic Tram"*. Traffic in the area is *"expected to flow without extreme inconvenience"* with the tram in operation.

Trams should be able to share the intersections with other vehicles at any time of the day, given the current traffic volumes. Some type of signal pre-emption will probably be necessary, at additional cost. The most difficult intersections were forecast to be Taranaki / Manners and Taranaki / Wakefield at peak hours.

WCC recommended a more detailed investigation if the proposal goes beyond the feasibility stage.

The use of trams with dimensions and turning characteristics similar to that of the old Wellington trams were recommended; these trams have the advantage of requiring less space for turning and are narrower than other options.

Lambton Quay would require alteration at the Grey Street intersection and at Hunter Street. Traffic signals at three locations would also require alteration or installation. WCC estimated that these works would cost at least $140,000 if old Wellington trams were used. WCC recommended a full costing was undertaken if the project goes ahead beyond the initial stage.

7.2 Main Assumptions

WCC assumed minimum turning curves for Wellington trams of 13 metres – these trams were 13 metres long and 2.2 metres wide, with bogies 2.5 metres from either end. The largest tram considered was 15 x 2.65 metres with bogies at one end and 10 metres from the other end. The maximum turn radius tested was 20 metres. The gauge for the analysis was 1.067 metres or 3'6".

The highest frequency of trams around the loop was assumed at 3.75 minutes. This corresponded to trams every second cycle of a typical busy 120 second cycle intersection. Trams would probably run every ten minutes - a much lower service interval - which would be to the advantage of other traffic.

WCC stressed their cost estimates were approximate only and were not carried by a quantity surveyor, nor accompanied by a site investigation. WCC's estimates were exclusive of:

- Laying of foundations and tracks.
- Diversion and modification of all underground/overhead services.
- Trolley/overhead power supply and cabling works.
- Land and building encroachment/usage costs.
- All legal and property costs including risk of legal actions.
- Environmental and street enhancement work.
- Traffic diversion and management cost.
- Additional traffic signs, parking and roading works.
- Damages to traffic signal detection system.
- Future maintenance cost of traffic signals.

The corners of the route were checked for a tram turning manoeuvre. Since the dimensions of tram units were not finalised, the following assumptions were made:

- NZR gauge: 1.067m gauge (3'6")
- twenty metre curve radius to inside track
- two 15x2.65m units with bogies at 0m and 10m
- loop is clockwise in direction

These assumptions were considered conservative. Based on them, all except the Grey St Lambton Quay corner were negotiable.

Grey Street was blocked off to vehicles by a paved footpath area alongside the ANZ bank tiled courtyard. The intersection was a 125 degree corner, the most severe turn of the proposed tram route.

Old Wellington trams were 13m x 2.2m with bogies 2.5m from either end. They could turn tight corners, with a 13m radius. Curves of radius 13, 15 and 20m were plotted on aerials of the Grey Street / Lambton Quay intersection. In all cases, the swept path of the tram as it turned impinged on the ANZ courtyard. If the 13 metre curve and old Wellington tram dimensions were used, the area of courtyard required for a turn into the bus lane on the western side of Lambton Quay (aerial 2) would be in the region of $25m^2$. An initial estimate of the cost of altering this corner was $4,000. This cost would vary depending on the type of tram unit chosen.

7.3 Route Commentary

WCC considered the proposed route maximised access to the Golden Mile whilst not compromising traffic operations reasonably unfavourably. All intersections along the anti-clockwise route were examined and whilst trams would significantly affect other traffic flows in the city, WCC considered that the proposed route was a potentially workable option.

If this route was to run in a clockwise direction, the Taranaki / Manners intersection would be more difficult to integrate trams into than the proposed anticlockwise loop. Trams opposing one way traffic in Manners and Victoria Streets would require a separate lane, reducing the capacity for other traffic. If the loop was run in the clockwise direction, the Manners Willis corner may be a better option than the proposed Manners Victoria intersection. The proposed route also makes use of bus lanes which could not be used for trams if the loop was clockwise in direction.

WCC noted that the proposed option did not access Courtenay Place directly in the tram route although key tourist areas were included on the Cable Car to Taranaki Loop. Also, the left turn from Manners St into Taranaki St was likely to have less severe effects on traffic operations than if the route went through the intersection to Courtenay Place.

7.4 Grey St- Lambton Quay

If a 20 metre radius turn was used, the tram would need to make a turn from the north of Grey St to the west of Lambton Quay and cut into the ANZ courtyard by at least 100m^2. The movement would not be confined to one lane, and other traffic movements in Lambton Quay would be affected.

If a 13 metre radius curve and vehicles of the same dimensions as the old Wellington trams were used, it would be possible to turn into the eastern Lambton Quay lane taking approximately 25m^2 off the corner. An initial cost estimate for this alteration was $8,000. The introduction of signals controlling this intersection were expected to cost approximately $26,000.

7.5 Lambton Quay

The tram would probably operate in the bus lanes along Lambton Quay. To continue the tracks beyond Hunter Street would require the removal of about 175m^2 of the traffic island at an estimated cost of $20,000. The new intersection would operate much as it does at present, with trams activating the current bus phase but travelling straight ahead instead of turning left.

South of Hunter Street, Lambton Quay is 6 metres wide. This is just wide enough for one tram and one vehicle lane to run in opposite directions. Once again the amount of space required for the Lambton Willis corner would depend on the dimensions of the tram.

For old Wellington trams, the current intersection has sufficient space. If the trams were 2.65 metres wide, 15 metres long and turning on a 20m radius (the largest assessed) half a metre of pavement would be required for the 8m north of the intersection. The estimated cost for this alteration was $4,000. It could possibly be carried out in conjunction with future development on the old BNZ corner.

Traffic signal changes at the Willis/Lambton intersection were estimated to cost $8,000. The phasing arrangements with the introduction of trams could be organised to enable trams to run in a separate phase instead of the current pedestrian only phase. This option would have obvious drawbacks for pedestrians, but it is a way that trams could operate without introducing significant increases in delays and queues.

7.6 Willis and Mercer Streets

The current left hand turn phase from Willis St to Mercer St could accommodate tram turns. If the smaller trams were used, the kerbside lane could be used for the entire turning movement and trams would enter Victoria St at the left of all other traffic. The parking on Mercer St could be used to extend some of the vehicle lanes. It would definitely be required if a wide radius turn and larger tram dimensions were used.

7.7 Victoria Street

When the Victoria/Willis one way pair was completed, two through lanes at the Manners/Victoria intersection would prevent turning trams left into Manners Mall from severely slowing other traffic. It was expected that trams would queue with other traffic and use the present signal phases. Signal actuation from the trams was considered a possibility.

7.8 Manners Mall

While it is favourable for shoppers and other mall users to have transport to their destinations, pedestrian's safety must be well planned for. Tram systems in other parts of the world have bars alongside tram tracks, bells to give advanced warning of trams and cushioned scoops at either end to collect objects in the tram's path. Some or all of these measures could be used in Manners Mall. At Cuba St, the tram may be able to use the current pedestrian phase and continue to the Taranaki St intersection, but introduction of a third phase may provide a safer option for pedestrians. If trams run at a 3.75 minute interval, traffic operations in Manners St should not be significantly worse than at present.

7.9 Taranaki and Manners Intersection

This is a key intersection operating close to capacity in peak periods. The Manners St approach is not one of the busiest, but the addition of trams would affect the entire intersection. The length of trams and travel characteristics would be important, as they will determine the time required for the through and left hand turn phase from Manners St. The time given for this phase is determined by demand; SIDRA predicts a 26sec cycle during the evening peak period. If the trams travel at an average speed of 12kph and consist of two 13m carriages, the left turn movement would take just under 11sec.

7.10 Taranaki Street

Difficulties could occur in the 125 metre block of Taranaki Street between Courtenay Place and Wakefield Street as trams would have to move from the curb side to the centre lane to cross the Taranaki / Wakefield intersection. This could cause potential problems to other traffic from Taranaki Street south, as it negotiates two busy intersections and also keeps clear of the tram tracks.

7.11 Wakefield / Taranaki Intersection

This is another busy intersection which would receive additional pressure if used by trams. However the Lambton Harbour development and subsequent closure of the wharf area for parking is expected to lower demand from the Taranaki Street north approach. Reducing the current four phases to three would improve operations and possibly compensate for the addition of trams. Trams would need to shift positions on the carriageway to queue for the Cable Street lights, posing the same traffic operation concerns as at the previous intersection.

7.12 Lambton Harbour

The developers of Lambton Harbour would require to be consulted before finalising the precise route of the tramway through the harbour area.

7.13 Queens Wharf and Grey Street

With the Lambton Harbour development, the Queens Wharf entrance at Post Office Square would remain open for pedestrians and trams only and Grey Street from Jervois Quay to Customhouse Quay would become one way (west). The Customhouse / Grey Street intersection could become a priority intersection, with Customhouse Quay traffic giving way to trams. Signals would be necessary at Featherston/Grey, at an estimated cost of $75,000.

7.14 Two Way Tram Considerations

Two way trams on city streets would generally require a separate part of the carriageway for tram use only. In Taranaki Street, the tram tracks could be set in the centre of the road and operate within the current signal phase. At Victoria Street, it would be desirable to have the northbound tracks using Manners / Willis. This would mean that traffic could also share the road taken up by the tracks in at least part of the one way system.

This would make a Manners Mall passing bay unnecessary. For the rest of the route, a lane would need to be devoted to trams only, severely affecting the traffic operations in Lambton Quay and Willis Street.

A lane would not be available for both buses and trams in Willis Street and Lambton Quay if the trams run in two directions. South bound buses would probably have to be rerouted away from Willis Street and bus passengers could experience longer delay to their journeys.

The south end of Lambton Quay is narrow and separate lanes for trams and traffic would probably require some of the footpath outside the old BNZ building. Developing Lambton Quay as a transit mall for pedestrians and trams would be an option.

The alterations for signals if the loop was two directional were not expected to be considerably larger than for the one way loop. Extra signal poles would be required at the Manners / Cuba and Lambton Quay / Grey Street corners and the detection for trams would have to be from both directions. An additional $25,000 should cover the additional changes to signals and an estimate of $5,000 per loop was suggested for the intersections where laying the tram rails will displace existing detection loops.

If trams were introduced in the city, a comprehensive signal pre-emption system would be required.

The WCC considers the Tramway proposal "workable". However, the Traffic Management assessment was of a preliminary nature and the WCC would recommend a more detailed analysis of the traffic operations along the route be undertaken if the proposal is taken further.

Plate 11: Two trams passing each other at the intersection of Willis and Lambton Quay

Photograph courtesy of Graham Stewart

Sketch 3: Museum to Queens Wharf and Taranaki Street to Wharf

Sketch by Daryl Cockburn

8. Operating Arrangements, Safety, Planning & Legal Issues

8.1 Operating Arrangements

Dr David Watson of the Wellington Regional Council assisted with this section. If the Tramway is a genuine commercial enterprise, the Wellington Regional Council would call tenders to build, operate and maintain the Tramway or a private company would offer outright to provide the service for no subsidy.

The risks and nature of the Tramway are such that some Local Authority funding is likely to be required. If this the case, Tramway construction, management and operation may be best organised by the Wellington Cable Car Ltd which is owned by the Wellington City Council and funded by the Regional Council. In 1993, the Wellington Cable Car had only one full time staff member and a part time manager. Extra staff would be required to manage the Tramway. Wellington Cable Car would contract out for the provision of the tram services.

The successful tender would provide the trams (possibly leased) and operate the service. Any revenue would go to the contractor to offset the lease and running costs. Tenderers would either offer to pay WCC Ltd to run the service (because of high revenue expectations) or seek a payment. Alternatively, the WCC Ltd could own or lease the trams themselves and tender the operation and maintenance:- this is similar to the current arrangement for the Cable Car.

Any of the above approaches excepting a private company without subsidy would require special competitive pricing process to be authorised by Transit New Zealand.

At present, Tranzit New Zealand provides a subsidy for trolley bus operations to take account of (i) the environmental benefits (lower noise and local air pollution) afforded by trolley buses and (ii) higher operation costs compared to diesel buses. The subsidy is paid to Stagecoach via the Wellington Regional Council via the Wellington Cable Car. Whether a similar subsidy can be justified for the Tramway needs to be explored.

8.2 Safety Requirements

Any tram operator will require a licence and will be required to submit a safety system (Transport Services Licensing Amendment (No 3) 1992.

The safety system must contain a system of standards, practices, and procedures the operator proposes to follow in order to ensure the safety of persons likely to be significantly at risk of death or serious injury through the operation of a rail vehicle.

A set of requirements for the safety system are listed in section 6B of the Amendment.

8.3 District Plans and the Resource Management Act

Pacific Design and *Jefferies and Raizis Barristers & Solicitors* helped prepare this section.

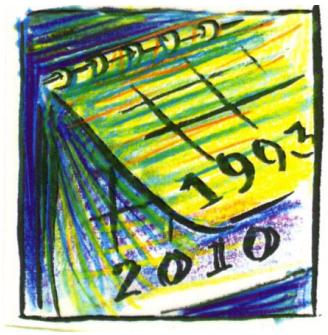
An Application to establish the infra-structure of the tramway would need to be made pursuant to *Section 73 "Preparation and Change of District Plans"*, and the *First Schedule, of the Resource Management Act 1991* (the Act).

The Tramway must either be included in the new District Plans, or the current Transitional District Plans must be changed.

Resource Management Act: The proposal must show that there is compliance with *Sections 5-8, 31,32 74, 75(2) and 104* of the Resource Management Act.

> **Section 5. Purpose:** That the Tramway promotes the sustainable management of resources, and avoids adverse effect on the environment.
>
> **Section 6. Matters of National Importance:** That public access to the harbour will be maintained and enhanced and Maori culture respected.
>
> **Section 7. Other Matters:** That the Tramway represents the efficient use and development of resources, the maintenance and enhancement of amenity values, and quality of the environment.
>
> **Section 31. Functions of Council under this Act:** That Council reviews methods for the integrated management of the city's resources, noise control etc..
>
> **Section 32. Duties to Consider Alternatives, Assess Benefits and Costs etc:** That alternatives to the Tramway have been considered, it will not create adverse effects on the environment, and adoption of a policy to establish the Tramway is the most efficient method of achieving the Purpose of the Act.
>
> **Section 74. Matters to be Considered by Councils & 75(2) Consents of District Plans:** That the Tramway is consistent with National and Regional Plans, and that it stated reasons and methods.
>
> **Section 104. Matters to be Considered (Decisions); and Four the Schedule; Assessment of Environmental Effects:** A description and assessment of the effects of the Tramway will be required.

Annual Plans: Council will need to include provisions for the Tramway



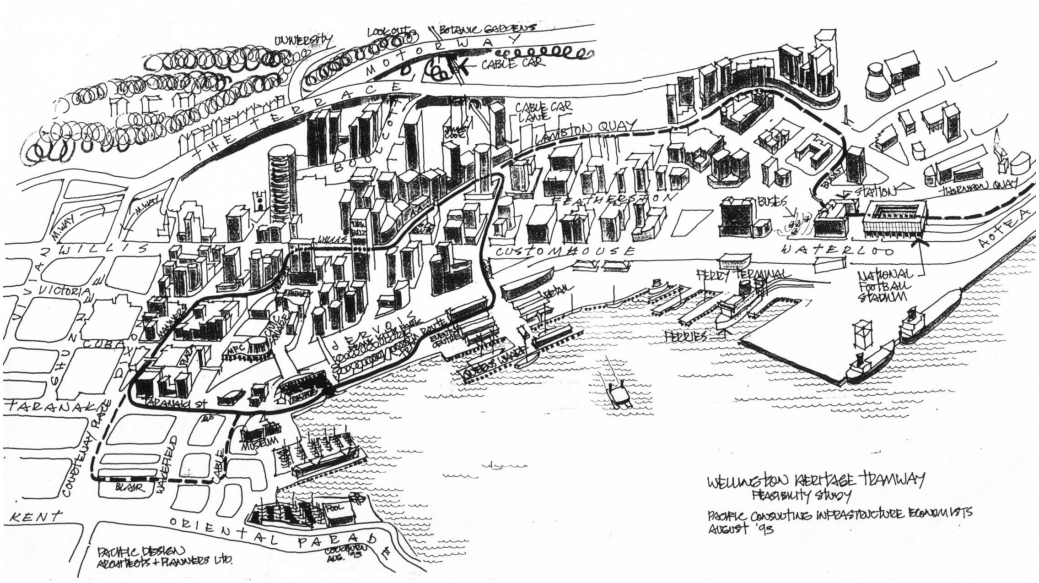
9. Future Options

There are appear two natural extensions to the system:

- Extension via Wakefield and Blair Street to Courtenay Place
- Linking into heavy rail at Wellington Rail Station and Courtenay Place using Light Rail.

Sketch 4 shows the two possible tramway extensions and also shows (i) the potential move of the Interislander Terminal to Glasgow Wharf and (ii) new rugby station at the railway station.

Sketch 4: Possible Extensions to Wellington Heritage Tramway



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10. Developments Elsewhere

10.1 Introduction

Brent Efford of Transport 2000 greatly assisted with this section which provides a brief review of developments in Christchurch, America and elsewhere.

10.2 Christchurch

In 1993 Christchurch was constructing a two kilometre heritage tramway that takes in the major tourist attractions of the city centre. Track costs were estimated at three million (approx $1.5m per kilometre); overhead power $500,000; and depot one million. Tram car restoration was estimated at $150,000.

The original concept, approved in 1990, was to link Worcester Boulevard from Rolleston Avenue to Cathedral Square. The link was considered to be too short to be a viable as a tourist tramway. The link was therefore extended to provide a loop service. It is expected to be completed by November 1993.

The market research suggested that the Tramway would appeal to local people as well as visitors to Christchurch.

10.3 America

A number of American cities run a "heritage tramway" either on their own or as part of more extensive light rail networks. Current heritage tramways include:

Portland: Downtown shuttle service using replica cars, funded by local businesses. The service opened in 1991 and operates on a seven and a half minute headway sharing tracks with the light rail system.

San Jose: Historic tram shuttle service runs over a two kilometre portion of an LRT system as a city centre distributor, similar to Portland. Uses "various historic cars".

San Francisco: Heritage trolley operation and Historic Trolley Festival on surface tracks on Market Street (Modern LRT operations in subway beneath). May be extended as a tourist operation in the waterfront area.

Seattle: Four ex-Melbourne trams provide a twenty minute service on a three kilometre waterfront route. The service carries 154,000 passengers annually. The route is planned to be extended. The service provides an increasing commuter function. A full LRT system is planned. Seattle also has an extensive trolleybus network.

Detroit: A two kilometre 900 mm gauge tourist tramway runs in the downtown area using seven historic cars from Lisboa and one double decker from Burton (England).

Other tourist/ heritage type operations also operate in:

- Dallas
- Galveston
- New Orleans
- Memphis

10.4 Heritage Tramways Elsewhere

There are a few heritage tramways outside America, e.g. Bendigo Australia. A few cities, such as Melbourne and Hong Kong, operate old trams in regular service simply because of a slowness to upgrade. Many other cities operating modern tramway / light rail systems have preserved a selection of old vehicles for operation on special occasions.

Sketch 5: Victoria Street Tram from Mercer Street to Manners Mall

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11. Information Centre

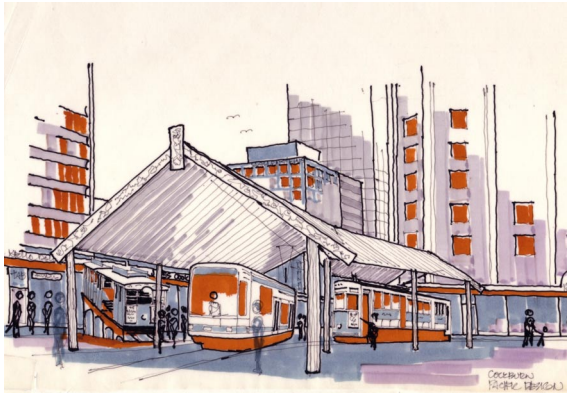
Athfield Architects proposed an imaginative scheme to utilise a wharf crane and a Cable Car at intersection of Lambton and Grey Streets. The Cable Car would be held at an angle by the Crane. This scheme has tourist potential but may not be practical and would be costly.

A simpler scheme is suggested which would both fit in and enhance the Tramway proposal: a roofed "station" with Maori arch decorations is recommended. An architectural drawing prepared by *Pacific Design* is presented in Sketch 6.

The proposal is for a glass roof built over the Lambton and Grey streets between the existing canopies (approx 15 metres) has been estimated to cost 7,000 per metre run. The total cost would be $105,000. The ends of the glass roof should be decorated with carvings appropriate for a tourist and community facility. Aotea Square Auckland has a Maori arch which is well regarded. Costs for enhancement would be of the order of $20,000.

An original heritage cable car trailer with the provision of frame and track supports for public display would cost about $10,000. A purpose built information office building would cost around $1,200 per square metre excluding fit-out if built on free public land. Leased space would include initial leasing fees, plus annual charges. At 100 square metres the office would cost $120,000. Including architect and engineering fees (at 10%) suggests the total cost of the information office, Cable Car and roofed structure would be $300,000 (inc. contingency).

Sketch 6: An Information Centre could be integrated into a small terminal at the Cable Car featuring a Maori Arch



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